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November 24, 2010

BY E-MAIL AND FEDERAL EXPRESS

Ms. Ignacia S. Moreno
Assistant Attorney General
Environment and Natural Resources Division
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611

RE: *United States and the State of Wisconsin v. NCR Corp., et al.*
Case No. 10-C-910 (E.D. Wis.)
D.J. Ref. No. 90-11-2-1045/3

Dear Ms. Moreno:

NCR Corporation ("NCR") submits the following Comments in opposition to the Consent Decree proposed to be entered between the United States and the State of Wisconsin (collectively, the "Governments") and Georgia-Pacific Consumer Products Company ("Proposed Consent Decree").[1]

Stated simply, the Proposed Consent Decree is unfair, unreasonable and inconsistent with CERCLA because it does not account for:

- GP's substantial discharges of PCBs to the Lower Fox River, including discharges upriver of the 1,050 foot line on Exhibit B to the Proposed Consent Decree (the "Line"); and
- GP's decision not to comply with the Governments' cleanup order and to instead sit on the side lines while others have been working to clean up the river.

[1] For the purposes of these Comments, NCR shall refer to Georgia-Pacific Consumer Products Company, along with its predecessors Fort Howard Paper Company, Fort Howard Corporation, and Fort James Corporation, collectively as "GP".

Given GP's massive liability and its refusal to participate in the cleanup work, there is no possible justification for a settlement that would (i) release GP from responsibility for almost 36 of the 39 miles of the Lower Fox River without requiring in return any payment of costs or commitment to help fund the cleanup; and (2) release GP from responsibility from the Governments' own costs related to the entirety of the river for a mere fraction of GP's true liability.

1. GP's Proposed Settlement Payment Is Not Proportional to Its Significant Liability.

a. GP Has Liability Upriver of the Line

GP was one of the largest, if not the largest, discharger of PCBs to the Lower Fox River. Expert analyses conducted for NCR have demonstrated that GP is responsible for at least 44% of the PCBs in Operable Unit 4. See Exhibit A (Declaration of Dr. John Connolly). This is not inconsistent with the analyses prepared by the Governments' own expert Gary Amendola, who similarly found GP responsible for nearly 40% of the PCBs in the river. See Exhibit B (Report of Gary Amendola Department of Justice). An opportunity for full discovery, not yet accorded any party, may reveal that GP's responsibility is even greater.

GP's role in causing the Fox River contamination is particularly egregious, moreover, because GP refused to take appropriate steps to curtail its PCB discharges. For example, even after learning in the early 1970s that PCBs could be harmful, GP did not investigate how much PCB-containing carbonless copy paper was present in the grades of paper it was using. Nor did it terminate or limit in any way its purchases of PCB-containing carbonless copy paper or the grades that might contain it. On the contrary, it increased its purchases of grades likely to have higher PCB concentrations and continued to recycle entire bales of PCB-containing carbonless copy paper. GP then actively concealed these activities from governmental review by omitting testing results and submitting misleading reports to the State of Wisconsin about the level of PCBs in the recovered paper it purchased. Throughout, GP resisted limitations on its PCB use and discharges: for example, in a 1985 interview, GP's Chief Executive insisted that GP would go out of business if it were required to meet new PCB discharge limits imposed by the State – even though virtually every other paper mill in Wisconsin already had met these limits.

Finally, the contamination resulting from these PCB releases is not limited to the area downriver of GP's facility.[2] Whereas in most instances solids discharged into a river flow

[2] That GP has liability for all of Operable Unit 4 has been the consistent position of the Governments. For example, in the Unilateral Administrative Order issued in November 2007, U.S. EPA asserted that GP was liable for remediating sediment contamination throughout Operable Unit 4, not just a subportion beginning near GP's outfall. That assertion was based in part on U.S. EPA's conclusion that GP had shipped bales of PCB-containing recovered paper to other paper recyclers, including the U.S. Paper mill in De Pere (at the upstream end of Operable Unit 4).

in the direction of the current, i.e., downriver, that is demonstrably not always the case around GP's facility. That area of the river is subject to flow reversals, in which the current actually reverses direction and flows "upriver," due to a phenomenon called the seiche effect. The seiche effect is a wind-driven force that causes the water in the bay of Green Bay to push back up into the Fox River. This force causes the water in the Fox River itself to rise and actually reverse directions. The aerial photographs attached as Exhibit C illustrate the seiche effect in action at the GP facility.

An expert working for Appleton Papers built a model to evaluate the impact of the seiche effect on discharges from GP. See Affidavit of Craig Jones, attached to the Comments of Appleton Papers Inc. on the Proposed Consent Decree (copy attached as Exhibit D). That model shows that solids discharged by GP would have been carried upriver and would have settled beyond the Line – in some cases, as far as the Highway 172 bridge. The difference between the Line and the Highway 172 bridge, moreover, is significant: according to estimates by the contractors performing the cleanup, the cost to remediate just that intervening area exceeds $80 million. See Exhibit E (cost estimates).

Thus, GP has liability for cleaning PCB contamination upriver of the Line. Under the terms of the Proposed Consent Decree, however, GP pays nothing—zero dollars—in exchange for a release of that liability. The amount to be paid, then, is demonstrably not proportional to GP's liability, and therefore the settlement is not and cannot be substantively fair. See e.g., United States v. Nalco Chem. Corp., 1996 U.S. Dist. Lexis 13089 (N.D. Ill. Sept. 4, 1996)(court rejected consent decree because the funds to be paid were not commensurate with the liability at issue, noting: "Barring contribution claims without providing the holder of the claims any compensation is not consistent with the goals of CERCLA").

NCR wishes to be expressly clear that it is not disagreeing with certain premises that necessarily underlie the Proposed Consent Decree: that liability in Operable Unit 4 and elsewhere in the river is capable of reasonable apportionment, and that GP's liability for Operable Unit 4 extends upriver of its outfalls. Those points are sound, as a general matter. It is simply that the Line "negotiated" by the Governments in this instance cannot be reasonably justified.

b. GP's Proper Share of Oversight Costs Is Much Larger

The release for the Governments' oversight costs is especially inequitable. As noted above, GP's overall share has been estimated, by the Governments and others, at nearly

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No explanation has been provided for why the Governments have abandoned a position they asserted only three years ago.

40% or higher. Yet the $7 million to be paid by GP is not even close to 40% of the Governments' total anticipated costs, which, according to information provided by Government representatives at a public hearing on November 18, could be as much as $45 million. Thus GP is being offered a remarkably attractive deal—15% of total Government costs—when even the Governments' own data mandate that it should pay more than twice this, or at least $18 million, exclusive of penalties and premiums.[3] As a result, this component of the settlement also fails to meet the basic requirements of fairness. See e.g., Kelley v. Wagner, 930 F. Supp. 293, 299 (E.D. Mich. 1996)(rejecting a consent decree where the State of Michigan and a PRP "failed to explain how they rationally arrived at a figure that does not appear to be 'in the ballpark' of the State's own estimate of [the PRP's] liability").

Notably, the Governments have offered no explanation for why these key components of the settlement are fair or appropriate (other than the vague statement, made at the public meeting, that they were "negotiated"). No scientific reports or expert analyses have been provided to justify the Line or the small share GP would pay toward the Governments' costs. Not only is this failure sufficient by itself to undo the settlement, see e.g., United States v. Montrose Chem. Corp., 50 F.3d 741, 747 (9th Cir. 1995)(settlement rejected where no explanation was provided for settlement amounts), but it also raises significant questions about the negotiation process that produced this proposed settlement.[4]

Furthermore, the Proposed Consent Decree states in paragraph 11 that GP's $7 million payment includes "a premium on the projected Future Oversight Costs to cover the risks and uncertainties associated with this settlement, including but not limited to the risk that the oversight costs will exceed current estimates." However, the Governments have not provided any information as to the amount of the premium, which according to guidance documents and policies used by EPA and the Department of Justice, should be substantial. *See* Guidance on Premium Payments in CERCLA Settlements (Nov. 17, 1988) ("In determining the total settlement amount, the premium payment must be added to the total response costs.... Generally, the settlement agreement should specify which portion of the premium payment is allocated to present liability and which portion to future liability"). On its face, the $7 million amount to be paid by GP cannot contain a substantial or even meaningful premium for oversight of a response action that is currently estimated to cost over $900 million, particularly in light of GP's substantial role as a discharger.

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[3] Also absent is any payment by GP of civil penalties under 42 U.S.C. §9606(b) stemming from its refusal to comply with the UAO. Instead, GP only stipulates that it will not contest that it is "liable to the US for all response actions that the UAO requires for Lower OU4 and OU5." GP does not commit to perform any work or provide any funding to perform the remediation in OU4 and OU5 or anywhere else at the site.

[4] NCR is not able to comment more fully at this time on whether the Proposed Consent Decree satisfies the requirement of procedural fairness. NCR submitted a Freedom of Information Request to the Governments on October 26, seeking information about the negotiation process. The Governments have not yet responded to those requests for information. Once they do, NCR may supplement these Comments accordingly.

2. The Proposed Consent Decree Would Improperly Reward a Recalcitrant PRP to the Detriment of the Public and the Parties Actually Performing the Cleanup.

The Proposed Consent Decree is not only non-proportional and unjustified, it also represents an extremely preferential resolution for a company that has not complied with the Governments' November 2007 Unilateral Administrative Order (UAO). For the Governments to countenance such an arrangement is to forfeit their key enforcement roles, and it will encourage other acknowledged polluters to ignore their obligations.

As a Government project manager acknowledged at the November 18 public meeting, although eight different companies (including GP) are required by the UAO to perform the Fox River cleanup, in fact only "two of them are really paying for it." Those two companies, of course, are NCR and API. The other six, including GP, have ignored the UAO since it was issued three years ago. While GP made modest contributions in the past, it has more recently ceased any involvement in or financial contribution to the remediation, and is honoring the UAO solely in the breach. It cannot properly be described as anything but a recalcitrant PRP, as that term is familiarly used in environmental law and policy. Yet GP is poised to have its conduct rewarded with a settlement that is remarkably one-sided and profitable.

Moreover, there should be concern that this proposed settlement could result in the creation of an orphan share. NCR and API, in funding the cleanup to date, have paid significantly more than their allocable shares. If, as is likely, GP is ultimately held responsible for a substantial share of liability for the Fox River much larger than contemplated in the Proposed Consent Decree, and NCR and API have discharged their own divisible shares, this settlement will create an orphan share for past and future Government costs that will have to be satisfied by the public.

While the Governments and GP may protest that, even though GP is not participating in the remediation activities today, it remains potentially liable for cleanup downriver of the Line, these comments make clear that this settlement neither complies with legal and policy requirements, nor makes sense from a practical standpoint in light of GP's long history as a polluter at the Fox River. It is all the more a concern that, as a party that is overtly refusing to comply with the UAO, it is being given an extremely preferential settlement notwithstanding its disregard of the law.

In accordance with 28 C.F.R. § 50.7 and 42 U.S.C. § 9622(d), the Department of Justice should withdraw or withhold its consent to the proposed settlement because it is inappropriate, inadequate and improper. Recalcitrant PRPs deserve no favorable treatment.

3. These Glaring Problems in the Proposed Consent Decree Can Be Corrected Through a Few Straightforward Modifications.

There are ready options for remedying these deficiencies in the Proposed Consent Decree. The Line demarcating the extent of GP's liability could be moved to a point just past the highest upriver point where GP's solids settled (i.e., the Highway 172 bridge), thus preserving NCR's and API's claims against GP for contribution for the costs of remediation in this part of the River. Alternatively, GP could be required to contribute an additional amount into the settlement commensurate with its share of the costs upriver of the Line. As for the oversight costs, the Governments could provide an estimate of their future costs, and then require GP to pay a share of the total oversight cost figure that is consistent with estimates of GP's total responsibility – plus a premium as is standard to reflect uncertainties for early cash-out settlements. Alternatively, the Governments could limit the release in the Proposed Consent Decree to cover only the Governments' past costs, and GP would continue to be responsible for its share of future oversight costs. Only if modifications like these are made can the Proposed Consent Decree be considered fair or consistent with CERCLA.

* * *

Since the beginning of the Superfund program, EPA's policy has been to take "aggressive enforcement action against those parties whose recalcitrance prevents settlements" and to seek "costs, penalties and treble damages" from recalcitrant parties. See Interim CERCLA Settlement Policy (Dec. 5, 1984) EC-P-2000-002. This policy statement properly describes GP, the party otherwise poised to benefit from the Proposed Consent Decree. As currently drafted, the Proposed Consent Decree bears all the hallmarks of a "sweetheart" deal that is at odds with Superfund law. GP would be released from paying oversight costs by tendering a mere fraction of what experts and the Governments themselves have found to be GP's actual share of responsibility. GP would also be released from responsibility for contaminated areas for which GP is clearly responsible, according to analyses prepared by the Governments themselves. And that release would be given without any monetary payment or explanation for how the Governments drew the Line. All this, remarkable enough for a *cooperating* PRP, is proposed for a party that is instead in flagrant *non-compliance* with the UAO, and that refuses to contribute financially to the ongoing work. Given these circumstances, it is difficult not to conclude that GP is enjoying inappropriate special treatment. Only by addressing the deficiencies identified above can the Governments correct this impression, restore confidence in its settlement authority, and enter into a consent decree with GP appropriate under the Superfund law.

NCR objects to the terms of the proposed settlement for the reasons set forth above, and specifically asks the Governments to respond to each of its comments in writing. Otherwise, when the Proposed Consent Decree is presented for final approval within the United States Department of Justice, it should be rejected.

Sincerely,

Evan B. Westerfield

cc: Jennifer Daniels
Edward Gallagher
John Hartje

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF WISCONSIN
GREEN BAY DIVISION

APPLETON PAPERS INC. and NCR CORPORATION, Plaintiffs, v. GEORGE A. WHITING PAPER COMPANY, ET AL., Defendants.	)	No. 08-CV-16-WCG

NCR CORPORATION, Plaintiff, v. KIMBERLY-CLARK CORPORATION, ET AL., Defendants.	)	No. 08-CV-0895-WCG

DECLARATION OF DR. JOHN CONNOLLY

I, John Connolly, of sound mind and full age, hereby state as follows:

1. I make this declaration based upon the facts and circumstances contained herein, which are true and correct to the best of my personal knowledge, information, and belief.
2. My name is John Connolly, and I am a partner at Anchor QEA, 305 West Grand Avenue, Montvale, NJ 07645.
3. QEA, now Anchor QEA, was retained initially by Sidley Austin LLP on behalf of NCR Corporation to provide consulting services in connection with the alleged releases of PCBs into the Lower Fox River. In March 2010, I was asked to prepare an expert report regarding the identification of sources of PCB contamination in the areas of the Fox River below the Depere dam, referred to as Operable Unit 4 ("OU4"). A copy of my

expert report summarizing my work, analyses and conclusions on this project is attached hereto as Exhibit A ("Anchor QEA Expert Report") and incorporated herein by reference.

4. I have been qualified to testify as an expert on the issues covered by my report in federal court.

5. I graduated from The University of Texas at Austin, Ph.D., Manhattan College, M.E., Environmental Engineering, and Manhattan College, B.E., Civil Engineering.

6. I am a recognized expert on contaminated sediment issues, particularly sediments contaminated with PCBs. I have worked on numerous contaminated sediment sites, including the Hudson River, the Housatonic River, Lavaca Bay, the Grasse River, and Southern California Bight (in addition to the Fox River). I have served as an expert witness for industry and government agencies and have provided testimony before the U.S. Congress and the New York State Assembly. I am a member of the USEPA Science Advisory Board and was recently elected to the National Academy of Engineering. I have produced numerous presentations and published articles relating to sediment issues.

7. The opinions contained in the QEA Expert Report are based on my review of documents relating to the Fox River and the contamination there; my analysis of sediment samples; and my education and my professional experience in the this area.

8. The purpose of my analysis was to identify the sources of the PCB contamination located below the dam in OU4 and to determine the relative contribution of each of those sources. In order to do this, sediment cores within Operable Unit 3 ("OU3") and OU4 were collected. Sediment cores, extending downward into the river bed, may contain a historical record of the sediment that was "raining down" on that location in the past.

9. These sediment cores were analyzed in order to identify those cores that contained an accurate historical record of past PCB deposits, according to the methodology and procedures outlined in the Anchor QEA Expert Report. Those cores that did contain an accurate historical record were then further analyzed for PCBs, again according to the methodology and procedures outlined in the Anchor QEA Expert Report.

10. Next, the PCB concentrations in OU3 were compared with the PCB concentrations in both the first half of OU4 ("OU4A") and the second half of OU4 ("OU4B"). This was done using a marker chemical, Aroclor 1260. Aroclor 1260 is another mixture of PCBs that is quite distinct in composition from Aroclor 1242, the type of PCB used in carbonless copy paper. By measuring the ratio or proportion of Aroclor 1260 to Aroclor 1242 in the sediment in each location, it was possible to determine the amount of Aroclor 1242 added to the river by OU4 sources. The methodology and procedures used to do this are more specifically explained in the attached report.

11. Based on this comparison of the 1260-to-1242 ratio in different parts of the river, it was determined that there were new sources in OU4 (i.e., U.S. Paper and Georgia-Pacific). In addition, this comparison determined the relative contributions of PCBs to the river made by (1) sources upriver from the dam and (2) sources in OU4 (i.e., U.S. Paper and Georgia-Pacific).

12. Specifically, our best estimate, to a reasonable degree of scientific certainty, is that upstream sources contributed 38% of the total PCBs in OU4A and 22% of the PCBs in OU4B. Furthermore, based on a preliminary estimate, OU4A sources (i.e., U.S. Paper) contributed about 62% of the PCBs in OU4A and about 34% of the PCBs in OU4B, and OU4B sources (i.e., Georgia-Pacific) contributed about 44% of the PCBs in OU4B. The basis, methodology and procedures used to derive these estimates are contained in the attached Anchor QEA Expert Report.

13. In addition to the above work, I was also asked to give an opinion as to whether PCBs discharged into Operable Unit 2 ("OU2") could have made their way upriver so as to come to be located in, and cause harm to, the sediments or biota in Operable Unit 1 ("OU1"). Based on my review of numerous reports and other documentation concerning the Fox River in general and the Fox River PCB contamination in particular, as well as my education and experience in river dynamics, it is my opinion that such upstream transport of PCBs is not possible and did not occur. In that section of the river, the flow is consistently south-to-north (from upriver to downriver). While in some parts of the Fox River reversals in flow occur (such as in OU4 due to what is commonly known as the "seiche" effect), this does not and did not occur in OU2. PCBs discharged into the river in OU2 would be primarily absorbed to solid particles in the water column and so would preferentially flow with the current and away from (not into) OU1.

14. As mentioned above, the bases and other important information relating to the formulation of the opinions expressed here are contained in the Anchor QEA Expert Report, which is incorporated herein by reference.

Pursuant to 28 U.S.C. §1746, I declare under penalty of perjury that the foregoing is true and correct.

DATE: April 30, 2010

/s/ John Connolly
John Connolly, Ph.D., P.E., BCEE
Anchor QEA

EXHIBIT A

REPORT

CONTRIBUTION OF PCB SOURCES UPSTREAM OF THE DEPERE DAM TO PCBS FOUND IN THE SEDIMENTS BELOW THE DEPERE DAM FOX RIVER PCB ALLOCATION

Prepared for

Sidley Austin LLP
One South Dearborn
Chicago, Illinois 60603

For use in connection with Appleton Papers Inc. and NCR Corporation v. George A. Whiting Paper Company, et al., C.A. No. 08-CV-16-WCG; NCR Corporation v. Kimberly-Clark Corporation, et al., No. 08-CV-0895-WCG, United States District Court for the Eastern District of Wisconsin Green Bay Division

Prepared by

Anchor QEA, LLC
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April 2010

CONTRIBUTION OF PCB SOURCES UPSTREAM OF THE DEPERE DAM TO PCBS FOUND IN THE SEDIMENTS BELOW THE DEPERE DAM

FOX RIVER PCB ALLOCATION

Prepared for

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April 2010

John P. Connolly, Ph.D., P.E., BCEE

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LIST OF ACRONYMS AND ABBREVIATIONS

LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NEA	Northeast Analytical, Inc
OU	Operable Unit
PCB	polychlorinated biphenyl
QA/QC	Quality Assurance/Quality Control
QEA	Quantitative Environmental Analysis, LLC
RPD	relative percent difference
SDG	sample data group
TOC	total organic carbon
TS	total solids
USEPA	United States Environmental Protection Agency
%Rs	percent recoveries

EXECUTIVE SUMMARY

The work presented here estimates the relative contributions from sources upstream and downstream of the DePere Dam to the polychlorinated biphenyls (PCBs) in the Lower Fox River sediments downstream of the dam. The sediments downstream of the Depere Dam – an area also referred to as Operable Unit 4 (OU4) – are estimated to contain more than 85% of the PCB deposits that require remediation.

The work is based upon an analysis of sediments collected within the river and analyzed for PCBs. These sediments contain a record of the PCBs that were "raining down" on the river bed during the time that PCBs were discharged. As a result, our estimates of relative contribution are independent of information concerning plant operations or calculations of PCB loadings to the river.

A conceptually simple, data-based approach was used. Described in simple terms, we did the following:

We first determined, using the historical record contained in the sediment, how much total PCB was attached to particles in the water column and "raining down" on the sediment in OU3, just above the DePere dam, during the time of maximum PCB releases.

We next measured the historical record of Aroclor 1260 in both OU3 and OU4 sediments. As it turns out, there is a small amount of this PCB mixture in the Fox River sediments (a few percent of total PCB). The change in the level of Aroclor 1260 in the sediments from OU3 to OU4 was used to estimate the extent to which total PCBs from sources upstream of the dam were diluted within OU4. This information, along with the amount of total PCB measured in OU3 sediments, established, as a baseline or background, the PCB contribution to this area of the river from sources upriver of OU4.

We next determined, again using the historical record contained in the sediment, how much PCB was "raining down" on the sediment in OU4A and OU4B during the time of maximum PCB releases. The numbers were much higher than those observed just upriver above the dam. The fact that the numbers increased in this way – not something that customarily

happens as one moves downriver and away from a source – showed that there was a new source or sources in this area.

We then compared these numbers from OU4 with the baseline contribution from OU3 (the contribution of upriver sources). The marginal increase of the numbers from OU3 to OU4 – the delta – represented the relative magnitude, or contribution, of the sources below the dam. Based on this analysis, our best estimate, to a reasonable degree of scientific certainty, is that upstream sources contributed 38% of the total PCBs in OU4A and 22% of the PCBs in OU4B. OU4A sources (i.e., U.S. Paper) contributed approximately 62% of the total PCBs in OU4A and approximately 34% of the PCBs in OU4B. OU4B sources (i.e., Georgia-Pacific) contributed approximately 44% of the PCBs in OU4B.

QUALIFICATIONS

Dr. Connolly is a nationally recognized expert on contaminated sediments, having worked on many site investigations and produced numerous publications and presentations over the past 30 years. His work has been directed to sediment, surface water and groundwater contamination problems for the purposes of allocation among potential sources, evaluation of remedial options, remedy design or wasteload allocation (TMDLs). He is expert in water quality modeling and has been involved in the development of several commonly applied models. Dr. Connolly has worked on many of the largest and most contentious contaminated sediment sites in the country, including the Hudson River, Housatonic River, Lavaca Bay, Grasse River, Fox River and Southern California Bight. He is frequently called on to make presentations at regulatory hearings, community meetings and national and regional technical forums, and has participated in negotiations with regulatory agencies to craft consent decrees governing contaminated sediment sites. Dr. Connolly is frequently invited to participate in government and industry sponsored workshops. He has served as an expert witness for industry and government agencies and has provided testimony before the U.S. Congress and the New York State Assembly. He has worked throughout the U.S., in Latin America, and in Europe. Dr. Connolly is a member of the U.S. Environmental Protection Agency (USEPA) Science Advisory Board and has recently been elected to the National Academy of Engineering. A copy of Dr. Connolly's CV is attached as Appendix D.

The evaluation of contaminated sediment problems is one of Anchor QEA's core competencies. Senior staff have been involved in this field since it came to the forefront in the 1970s and have worked on most of the high profile sites in the U.S. as well as many smaller sites. Our personnel are recognized as national and international experts. They are routinely called on to lead national workshops and conferences directed to national policy and technology development. They have testified as expert witnesses, published extensively, and recently provided testimony to Congress. Anchor QEA's expertise includes risk assessment, computer modeling, contaminant fate and transport analysis, allocation support, environmental statistics, dredge and cap design, habitat restoration, and construction management.

The opinions and findings in this report are based upon my education, training, and experience, in addition to my analysis in this case. For the purposes of my analysis, my team

and I reviewed not only the substantial sediment data described in this report, but also numerous other reports and documentation relating to the Fox River and the hazardous substance contamination present there. I have reached the opinions expressed in this report to a reasonable degree of scientific and engineering certainty. Anchor QEA has been compensated at an hourly rate of $359/hour for my time on this matter.

1 INTRODUCTION

1.1 Objectives

The objective of the work presented here is to evaluate the sources of the polychlorinated biphenyls (PCBs) in the Lower Fox River downstream of the Depere Dam. This work provides an estimate of the relative contributions to this area by sources upstream and downstream of the dam.

The analysis is based on data collected within the river, and in particular, sediment samples that have been analyzed for PCBs and ^{137}Cs. The estimates of sources presented here are independent of information concerning plant operations or calculations of PCB loadings to the river based on historical documents and assumptions.

1.2 Conceptual Model of PCB Sources in the Fox River

Our analysis rests on three basic principles. The first principle is that river sediments can contain a historical record of the PCBs that were deposited on the sediment bed over time. Absent major disturbances of the sediment bed, a location in the river contains, extending downward, a time capsule of the amount and nature of PCBs that were "raining down" on the sediment bed at each point in history.

For example, in the Lower Fox River, after PCBs first entered the river, releases increased and then decreased. As a result, the vertical record of PCBs within the river sediment bed would be expected to exhibit concentrations that rise and then fall, producing a single peak concentration buried within the sediment bed The depth of that peak is in general representative of the time of maximum releases of PCBs in that location.

The second principle is that PCB concentrations in river sediments are higher near the source, and these concentrations diminish as you move downriver, absent any other new sources. Once discharged by a source, particles contaminated with PCBs are carried by river currents, forming a trail of contaminated sediment extending from the location at which the PCBs entered the river. In this trail, the concentrations of PCBs decline with distance from the source because of dilution with clean tributary water and particles, and because PCBs can volatilize from the water to the atmosphere. These PCB-contaminated particles settle to the

river bottom in accordance with their concentration in the water column, resulting in "gradient" of high concentration declining to lower concentrations, over the length of the river. This is illustrated in Figure 1-1. The concentration pattern in the lower panel qualitatively illustrates the development of a plume. In this illustration, concentration declines smoothly.

The upper panel in Figure 1-1 illustrates the Lower Fox River: OU3 ("operable unit 3") is the reach of the river immediately upstream of the Depere Dam; OU4 is the reach immediately downstream. Below the dam, PCB from upstream sources are diluted due to several factors, including additional inflows from tributaries; inflows from Green Bay;[1] and volatilization. While a decline with distance downstream is expected due to dilution, the shape of the concentration plume in the Lower Fox River may not necessarily match the smooth continuous decline that is illustrated here.

The third principle is that increases in measured PCB concentrations in sediment along this gradient can be indicative of new sources in that area. This is explained as follows. Occasionally, the declining "gradient" mentioned above will abruptly change, and an increase in PCB concentrations in sediment will be observed (either in terms of total PCB concentrations, or relative to some other marker, as will be discussed more below). The only explanation for this increase in measured PCB concentrations is that additional PCBs have been discharged by a new source in the area and have settled together with the PCBs settling from upriver. This is illustrated in Figure 1-2.

[1] The Green Bay contribution is analogous to contribution of ocean water in an estuary; it is due to the tide-like sloshing back and forth of the river that occurs due to seiche activity in Green Bay.

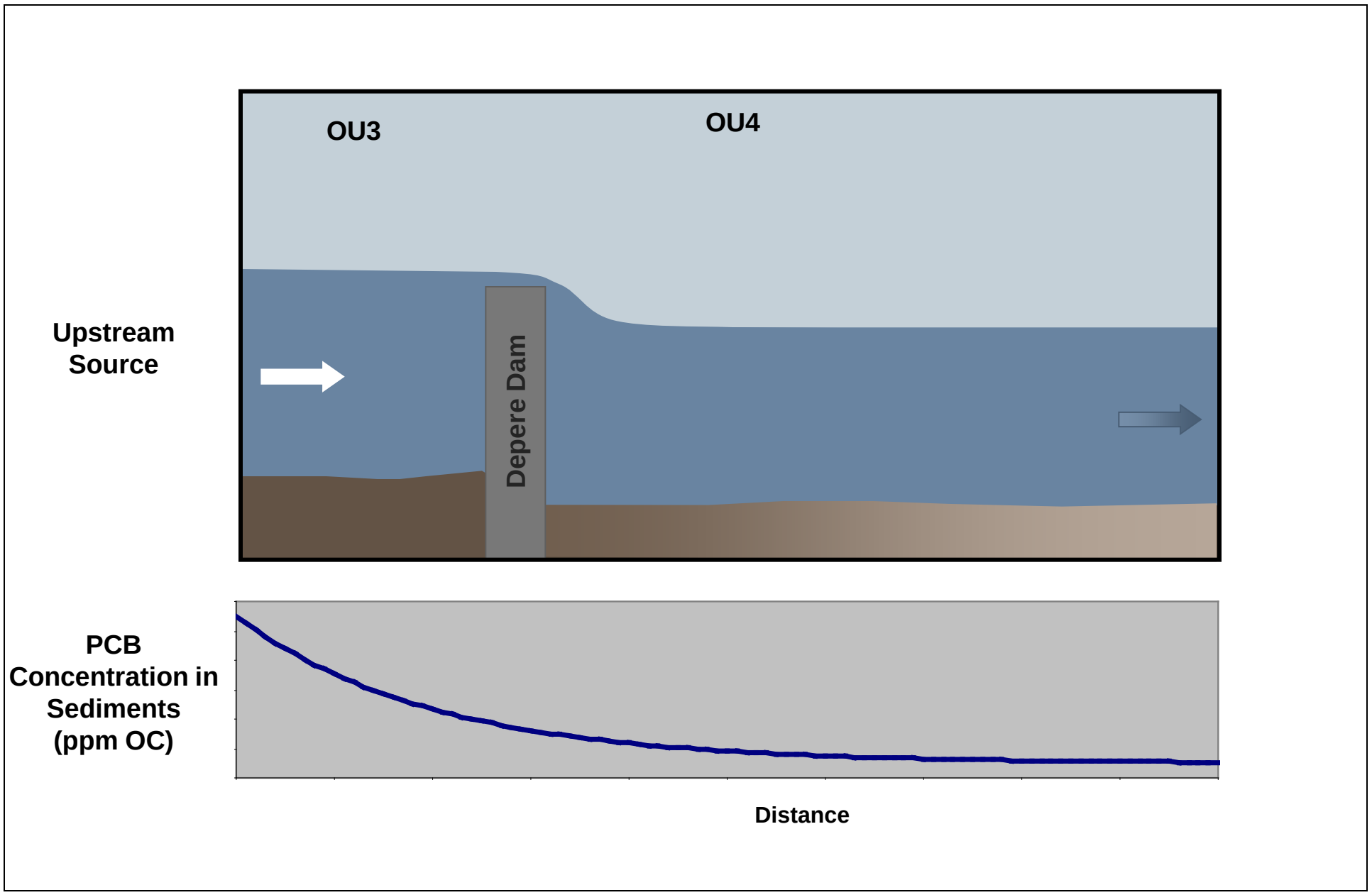


Figure 1-1
Conceptual Model: PCB Concentrations Decline with Distance Downstream from a Source
Fox River PCB Allocation
Sidley Austin LLP

ANCHOR QEA

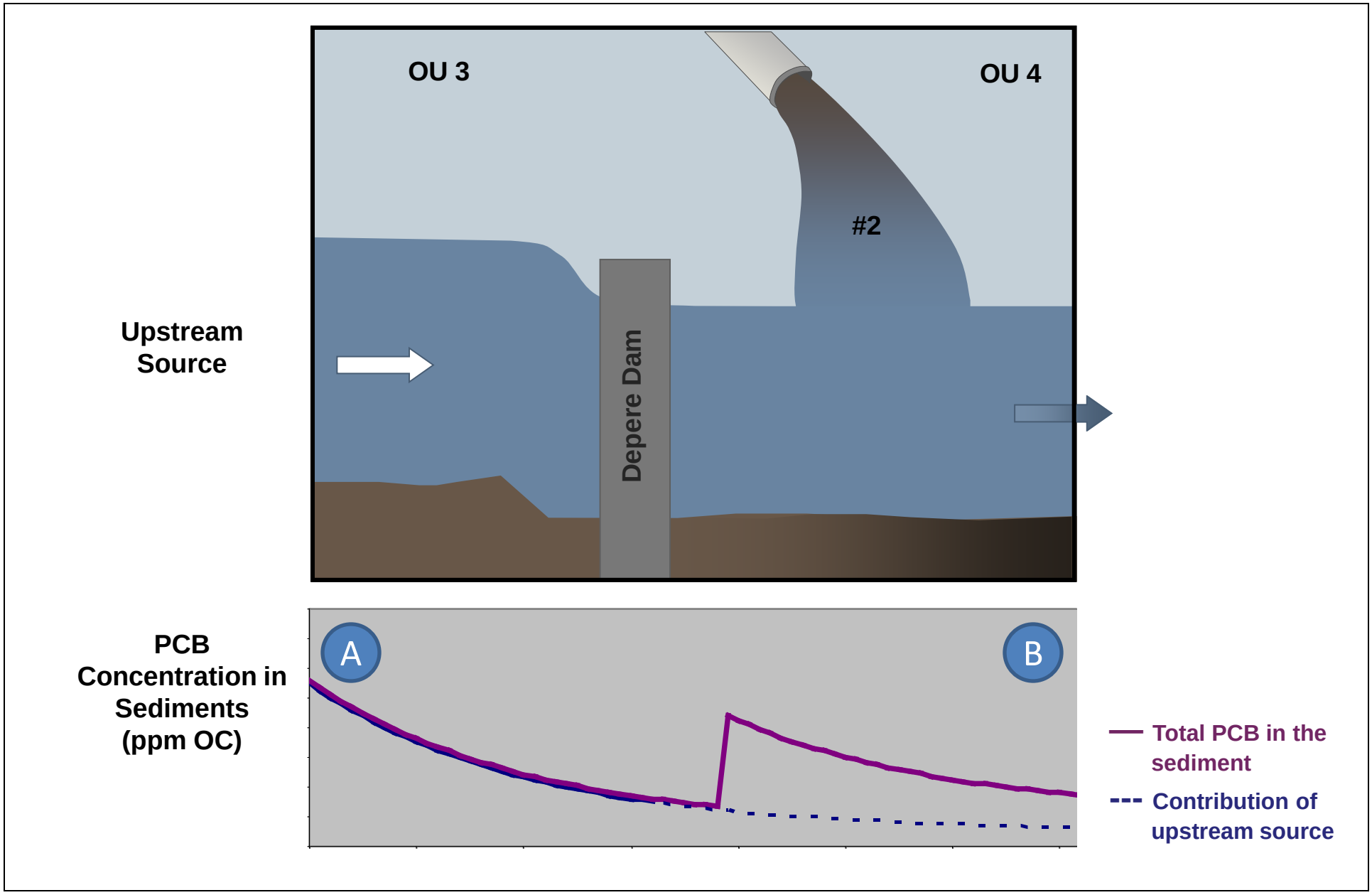


Figure 1-2
Conceptual Model: Multiple PCB Sources
Fox River PCB Allocation
Sidley Austin LLP

Given these three principles, it is possible to use sediment data to identify PCB sources to a river. In principle, if one observes an increase in PCB sediment concentrations at a point in a river, one can reasonably conclude that there is or was a new source of PCBs nearby.

However, this type of source identification based on the use of sediment data can only be done if appropriate steps are taken to ensure that the PCB data are analyzed in a consistent fashion throughout the study area. If one is going to compare PCB sediment concentrations at one point in a river with a point further downstream, one has to make sure one is comparing equivalent data. There are, in particular, two phenomena that need to be considered.

First, it is well-known that depositional patterns in a river vary. For example, in general, there is more deposition of sediment where the river is broad and currents are slower, and less deposition where the river is narrower and currents are swifter. As a result, there will often be more PCB in the more depositional areas of a river, and less PCB in the more erosional areas of a river. Unless these differences in river dynamics are taken into account, it will not be possible to reliably observe either the declining gradient or the change in gradient discussed above.

Fortunately, there is a standard methodology for adjusting for this phenomenon. It is called carbon normalization. Carbon normalization is a process whereby the PCB concentration in sediment is expressed not as the amount of PCBs within all the sediment in the sample, but instead as the amount of PCBs within just the organic carbon portion of the sediment in the sample. In other words, one equalizes or "normalize" between the two sampling locations using the carbon content of the sediment. By carbon normalizing, differences in PCB

concentrations due to certain extraneous factors (such as relative depositional or erosional features) are eliminated.[2]

The second phenomenon that needs to be considered is that rivers do not accumulate sediment evenly in all depositional locations. A sediment sample taken from a depth of 5 cm in one location may not be of the same vintage as a sediment sample taken from a depth of 5 cm in a different location. Some locations in a river are consistently depositional, but others experience deposition and erosion on a varying basis. For this reason, some areas in a river may contain an accurate historical record of what was deposited in that location, but other areas may not. If one wants to track the declining gradient of PCB concentrations, as well as changes to that gradient, over the course of the river, one needs to make sure that one is looking at a set of sediment samples that in fact contain an undisturbed historical record of what was deposited over time.

Again, there is a standard methodology for doing this. It relies on the use of radioactive cesium (^{137}Cs) that is present in river sediment. Beginning in 1954 and peaking in 1963, nuclear bomb testing in the atmosphere released quantities of the radioisotope ^{137}Cs throughout the world. Since that time, ^{137}Cs has been present in precipitation. As runoff occurs, ^{137}Cs attaches to eroded particles and enters water bodies where it can deposit on the bottom. The amounts that have settled have been extensively studied and a distinctive pattern has been observed. These studies have shown that in a steadily depositional environment, ^{137}Cs is present in low concentrations in shallow sediments; concentrations rise in deeper sediments until a peak is reached, corresponding to sediments deposited in 1963;

[2] The explanation for this is based on PCB chemistry. PCBs are hydrophobic, meaning that if they are discharged into a water column, they will quickly sorb (attach) to solid particles, if they are not attached already. In addition, PCBs show a strong affinity to organic matter, meaning that PCBs will preferentially attach to organic matter rather than the inorganic components of sediment particles. They will even transfer their attachment from a particle with less organic matter to one with more. Larger, heavier particles, such as sand, tend to have relatively little organic matter and therefore lower PCB concentrations. These settle primarily in the less depositional areas, where water currents tend to be faster. Finer particles, such as silt, are richer in organic matter and therefore tend to have higher PCB concentrations; these settle preferentially in the more depositional areas, where currents are slower. Typically, one normalizes the PCB data to the organic carbon content of the sediment sample, that is, one expresses PCB concentrations as a proportion of the organic carbon in the sample. (Carbon is a primary constituent of organic matter.) In this way one can eliminate the distorting effect of the inorganic material in the sample.

and then concentrations decline in the deeper sediments deposited before 1963. In sediments deposited prior to 1954, no ^{137}Cs should be present.

By looking at the pattern of ^{137}Cs in Fox River sediment cores, one can determine which areas contain a relatively undisturbed historical record of the materials that were "raining down" over time in that location. A core that contains the historical record of PCB contamination since the early 1950s should exhibit a vertical pattern or "profile" of ^{137}Cs that shows no ^{137}Cs in the deepest segments, a subsurface peak and then lower concentrations near the surface. This is illustrated by Figure 1-3, which presents data from a PCB core from the lower Fox River, showing the vertical profile of ^{137}Cs concentration. (Full information on all of the cores is provided in Section 3.) In this core, the concentration of ^{137}Cs is low in the deepest sediment, rises to its maximum concentration at a depth of 45 cm, and then declines in concentration in the shallow depths. This profile is what one expects to see in sediment that has been consistently depositional over time. This core therefore presents an accurate historical record of what was deposited in the area over time.

1.3 Source Strength Assessment

Sediment data can be used not only to identify sources of PCB discharges, but also to assess the relative magnitude of each source. In an ideal case, this could be done by comparing the total PCB concentration in a given location with the PCB concentration attributable to sources upriver of that location. The increase in concentration in the target, divided by that which is attributable to the upstream sources, reveals the magnitude of the new source in that location. For example, if the PCB concentration attributable to upstream sources is 100 ppm, and in location X the concentrations increase to 300 ppm, then it follows that there is a new source at location X and that its contribution to PCB deposits in location X was an additional 200 ppm or 67% of the total (200 ppm compared with the sum of 100 ppm from upstream sources + 200 ppm from the new source = 300 ppm total concentration in location X).

However, rivers rarely permit the use of such a simple approach for many of the reasons discussed above. One reason in particular is that PCB concentrations dilute moving downriver (see second principle above). It is therefore complicated to precisely estimate the

PCB concentration attributable to upstream sources in an area where other PCBs have been deposited. Referring to Figure 1-2, point B represents the location at which we wish to estimate the contributions of upstream PCB sources (represented by the blue line) and downstream sources (the pink line represents the sum of both sources; downstream sources are therefore represented by the difference between the two lines). The PCB concentration in the sediment at point A overestimates the contribution from upstream sources at point B because of dilution: that is, the blue dashed line is considerably lower at point B than at point A.

We cannot measure the blue dashed line directly, because in the Lower Fox River, nearly all of the PCBs that were released to the river consisted of the same mixture, Aroclor 1242. Aroclor 1242 from upstream of the Depere Dam is indistinguishable from Aroclor 1242 that entered the river downstream of the dam. Therefore, we cannot directly distinguish the blue line from the pink line. However, we can estimate the contribution of upstream PCBs to OU4 indirectly, employing the use of a marker chemical, specifically, PCB Aroclor 1260. Aroclor 1260 is another mixture of PCBs that is quite distinct in composition from Aroclor 1242; that was not used in carbonless copy paper; and that was apparently discharged by upstream sources and so is present in the sediment in both OU3 and OU4. Aroclors 1242 and 1260 are expected to behave similarly in the environment, because both attach strongly to particulate organic matter. The ratio of 1260 to 1242 (i.e., the proportion of 1260, provides a means to track the upstream PCBs and determine the amount of 1242 added by OU4 sources).

We first look at sediments from OU3 and determine the percentage of Aroclor 1260 to total PCBs. Absent a new source of PCBs to the river, this proportion of Aroclor 1260 to total PCBs should remain roughly the same all the way downriver, because Aroclors 1242 and 1260 are expected to dilute at nearly the same rate. Next, we make an important assumption: all Aroclor 1260 comes from upstream of the Depere Dam; that is, there has been no addition of Aroclor 1260 directly into OU4.[3] So, if the proportion of Aroclor 1260 to total PCBs changes, it signals the presence of a new source of Aroclor 1242. This is analogous to diluting a glass of juice with water: there is no change in the amount of fruit or sugar in the

[3] This is a conservative assumption: if Aroclor 1260 was added directly to OU4, then the computed contribution of upstream sources would be lower. See Appendix A.

glass, but it tastes more dilute because of the added water. Or to consider another example: if the proportion of Aroclor 1260 to total PCBs is OU3 is 3:100 (3%), but this proportion changes in OU4 to 3:300 (1%), it would mean that enough Aroclor 1242 had been added to the river in OU4 to triple the amount of Aroclor 1242 and thus reduce the ratio by a factor of three. This would mean that upstream sources would be responsible for approximately one-third of the Aroclor 1242 in OU4.

The magnitude of the change is expressed mathematically as follows:

$$Relative\ contribution\ of\ upstream\ PCBs = {}^{P_{1260,OU4}}\Big/_{P_{1260,OU3}} \qquad \text{Equation 1}$$

where:

$P_{1260,OU3}$ = proportion of Aroclor 1260 in samples collected in OU3

$P_{1260,OU4}$ = proportion of Aroclor 1260 in samples collected in OU4

The derivation of this equation is provided in Appendix A.

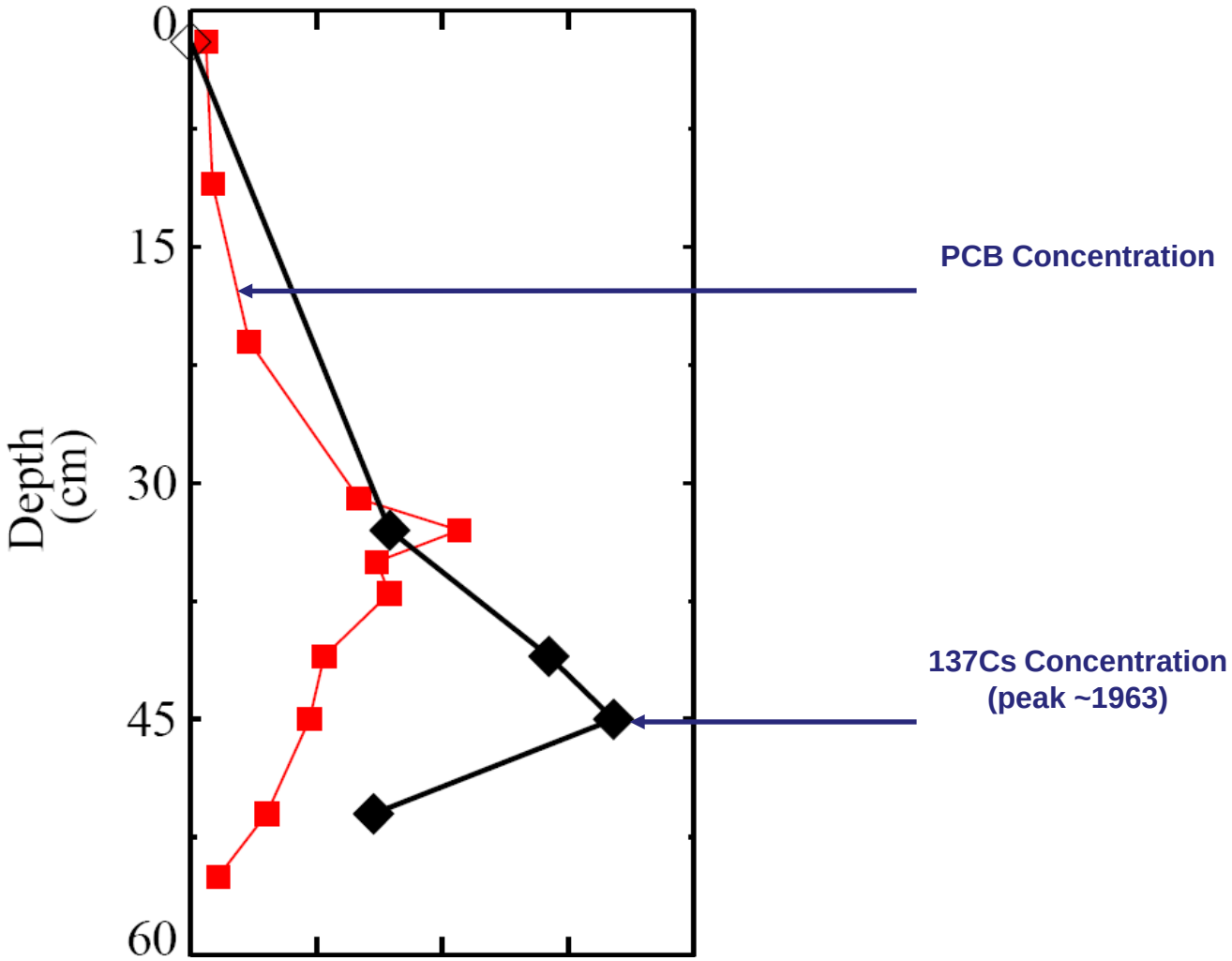
Thus, this ratio of proportions provides a measure of the relative contributions of upriver sources and OU4 sources to the PCBs present in OU4. The approach taken here involves measuring the proportion Aroclor 1260 in sediment samples from OU3 and OU4 and calculating these proportions and the ratio in Equation 1.

1.4 Approach

Sediment cores were collected from OU2, OU3 and OU4 in the Lower Fox River. Core lengths ranged from 1 to 3 m. They were sliced in 2-cm segments. Selected segments were analyzed in steps. First, total PCBs were analyzed using method 8082 in several segments throughout the core. Next, a subset of these segments was analyzed for congener PCBs, ^{137}Cs and total organic carbon. The congener PCB data provided the information needed to estimate total PCB concentration as well as the concentration of Aroclor 1260 in each sample. Proportion Aroclor 1260 was estimated for each segment and the average proportions were used in Equation 1.

In general, in the Lower Fox River, PCB concentrations at the surface of the sediment bed have decreased over time since the period of maximum release, in large part due to burial with cleaner solids. This means that, in general, the most contaminated portions of a sediment core lie buried beneath the surface. These highest concentrations buried within the sediment bed represent the PCB concentrations that were present at the surface of the sediment bed at the time of maximum releases to the river. It is this period that is of greatest interest in source allocation. Therefore, the analyses presented here focus on the buried segments of sediments cores that exhibit the maximum PCB concentrations.

The approach is illustrated in Figure 1-3. The core segment containing the peak PCB concentration (located 32 to 34 cm below the surface) is selected for estimating proportion Aroclor 1260 for use in Equation 1.



Data from core 4-12 were used to generate this figure.
See figures in Section 3 for full information on this core.

Figure 1-3
Schematic of a Core Showing a Representative Historical Record of PCB and 137Cs Concentrations
Fox River PCB Allocation
Sidley Austin LLP

2 DATA COLLECTION

2.1 Collection Locations

Sediment cores were collected from OU2 to OU4B, within areas that were likely depositional, and thus were likely to contain relatively undisturbed records of historical contamination. Cores were 3.5 inches in diameter and the target recovery lengths for the 54 targeted cores were 1, 2, or 3 m depending on location (Table 2-1). Core locations were moved if probing indicated there was an insufficient amount of sediment to collect a core of the target length. Core locations may also have shifted due to other factors, such as the water depth being too shallow to navigate the vessel to the location. Figure 2-1 shows the actual core sampling locations.

Table 2-1
Core Sample Target Locations

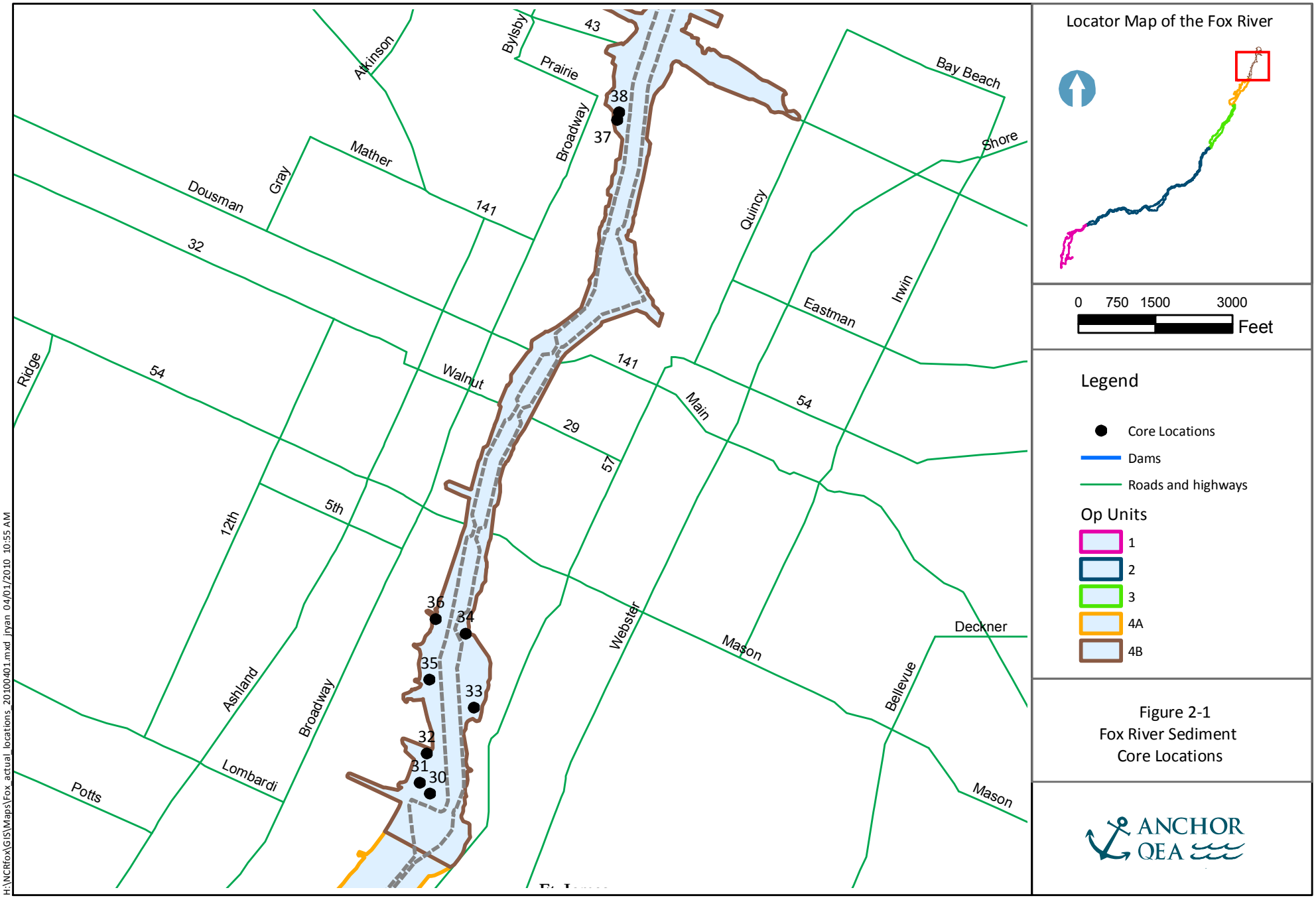
Core ID	OU	Target Recovery (m)	Sampled	Stage 1 Analysis
S4-38	4B	1	Sampled	Y
S4-37	4B	1	Sampled	Y
S4-36	4B	2	Sampled	N
S4-35	4B	2	Sampled	Y
S4-34	4B	2	Sampled	Y
S4-33	4B	2	Sampled	N
S4-32	4B	3	Sampled	Y
S4-31	4B	3	Sampled	N
S4-30	4B	3	Sampled	Y
S4-29	4A	3	Sampled	Y
S4-28	4A	3	Sampled	N
S4-27	4A	3	Sampled	Y
S4-26	4A	2	Sampled	Y
S4-25	4A	2	Sampled	N
S4-24	4A	3	Sampled	Y
S4-23	4A	3	Sampled	N
S4-22	4A	3	Sampled	Y
S4-21	4A	3	Sampled	N

Table 2-1
Core Sample Target Locations

Core ID	OU	Target Recovery (m)	Sampled	Stage 1 Analysis
S4-20	4A	3	Sampled	Y
S4-19	4A	3	Unable to Retain Core	N
S4-18	4A	2	Sampled	Y
S4-17	4A	2	Sampled	N
S4-16	4A	2	Sampled	Y
S4-15	4A	2	Sampled	N
S4-14	4A	2	Sampled	Y
S4-13	4A	2	Sampled	N
S4-12	4A	2	Sampled	Y
S4-11	4A	2	Sampled	Y
S4-10	4A	2	Sampled	Y
S4-9	4A	2	Sampled	N
S4-8	4A	2	Sampled	N
S4-7	4A	2	Sampled	Y
S4-6	4A	1	Sampled	N
S4-5	4A	1	Sampled	Y
S4-4	4A	2	Sampled	Y
S4-3	4A	2	Sampled	N
S4-2	4A	2	Sampled	N
S4-1	4A	2	Sampled	Y
S3-8	3	1	Sampled	Y
S3-7	3	1	Sampled	Y
S3-6	3	1	Sampled	Y
S3-5	3	1	Sampled	Y
S3-4	3	1	Sampled	Y
S3-3	3	1	Sampled	N
S3-2	3	1	Sampled	N
S3-1	3	1	Sampled	N
S2-8	2	1	Sampled	N
S2-7	2	1	Sampled	N
S2-6	2	1	No Access	N
S2-5	2	1	No Access	N

Table 2-1
Core Sample Target Locations

Core ID	OU	Target Recovery (m)	Sampled	Stage 1 Analysis
S2-4	2	1	No Access	N
S2-3	2	1	No Access	N
S2-2	2	1	Sampled	N
S2-1	2	1	Sampled	N



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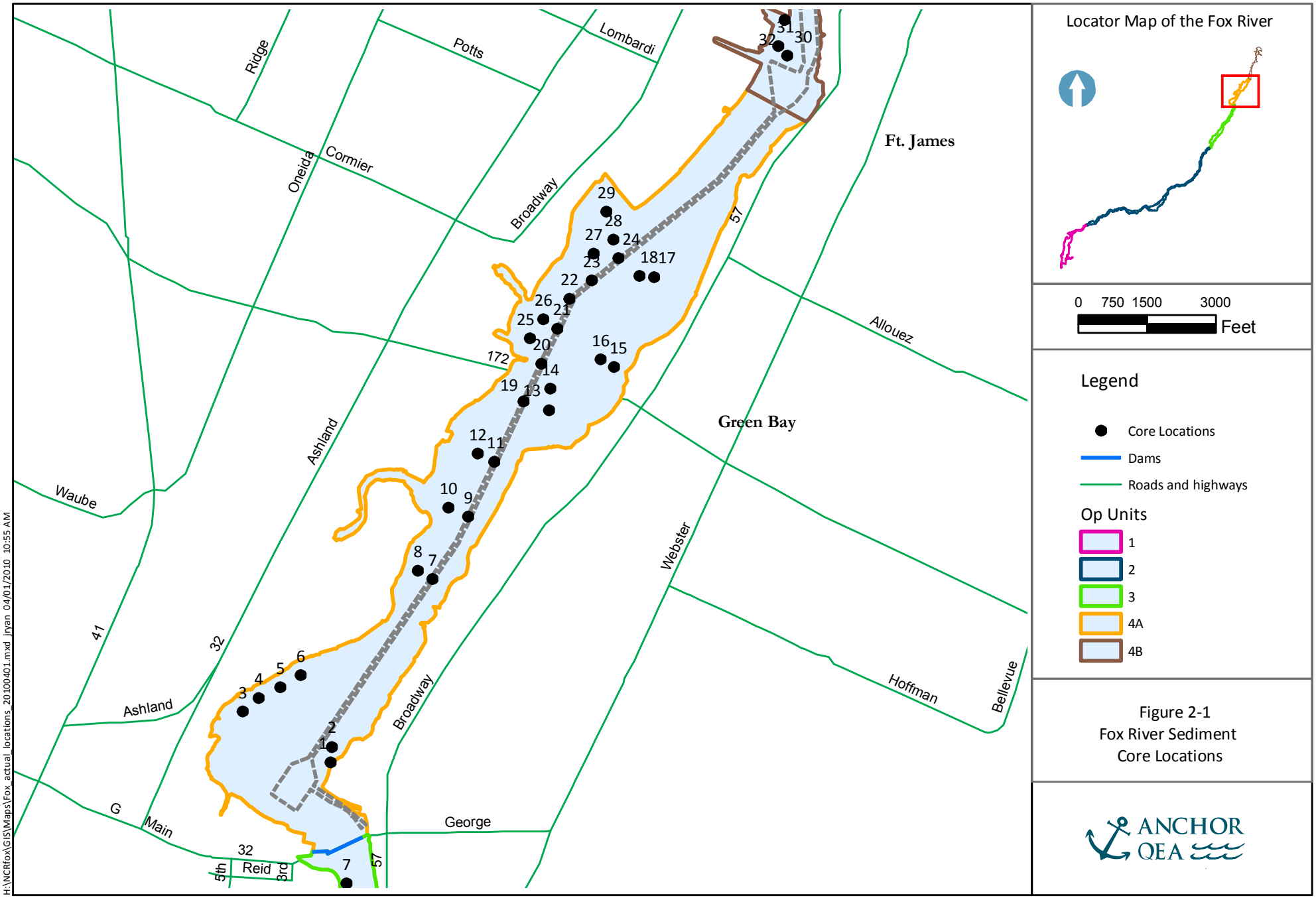
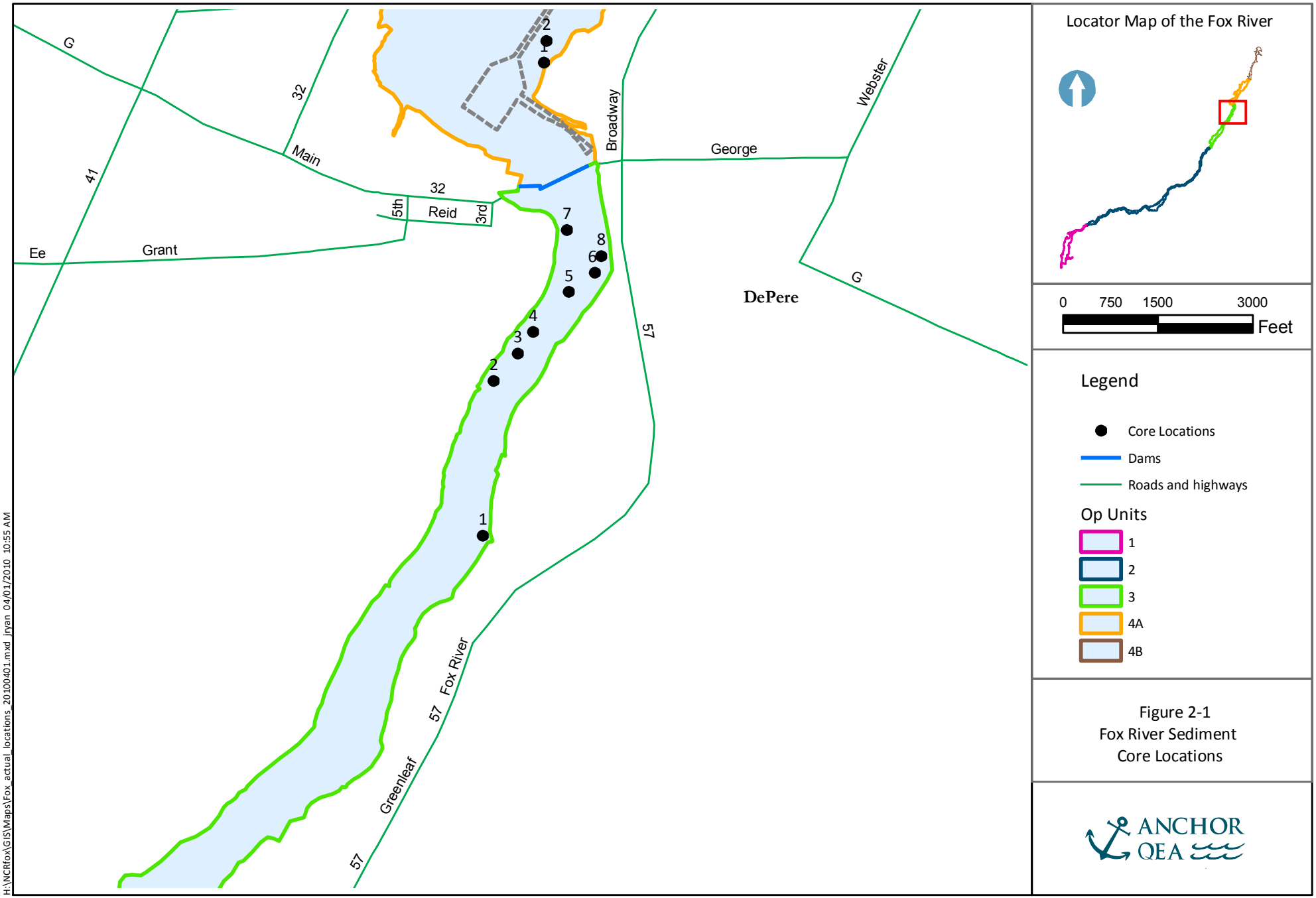
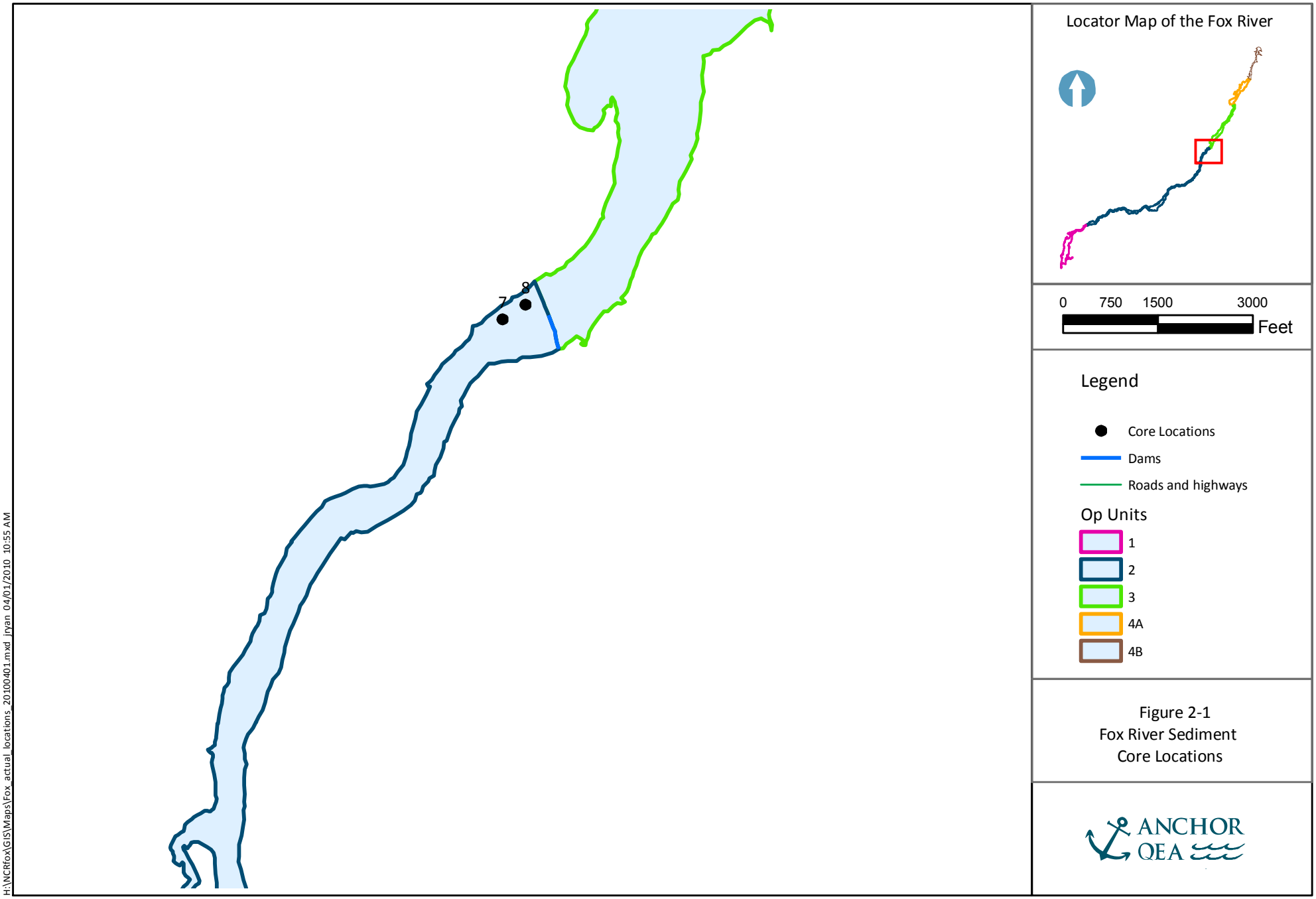

Locator Map of the Fox River
0 750 1500 3000
Feet
Legend
Core Locations
Dams
Roads and highways
Op Units
1
2
3
4A
4B
Figure 2-1
Fox River Sediment
Core Locations
ANCHOR QEA
Ft. James
Green Bay
Ridge
Potts
Lombardi
Oneida
Cormier
Broadway
Alouez
Ashland
Waube
Webster
Hoffman
Bellevue
George
Main
Reid
5th
3rd
41
32
57
172
H:\NCRfox\GIS\Maps\Fox_actual_locations_20100401.mxd jryan 04/01/2010 10:55 AM


G
32
41
Main
32
5th
Reid
3rd
Ee
Grant
Broadway
George
Webster
G
DePere
57
Fox River
57
Greenleaf
57
1
2
3
4
5
6
7
8
Locator Map of the Fox River
0
750
1500
3000
Feet
Legend
Core Locations
Dams
Roads and highways
Op Units
1
2
3
4A
4B
Figure 2-1
Fox River Sediment
Core Locations
ANCHOR QEA
H:\NCR\fox\GIS\Maps\Fox_actual_locations_20100401.mxd jryan 04/01/2010 10:55 AM


7
8
Locator Map of the Fox River
0
750
1500
3000
Feet
Legend
Core Locations
Dams
Roads and highways
Op Units
1
2
3
4A
4B
Figure 2-1
Fox River Sediment
Core Locations
ANCHOR QEA
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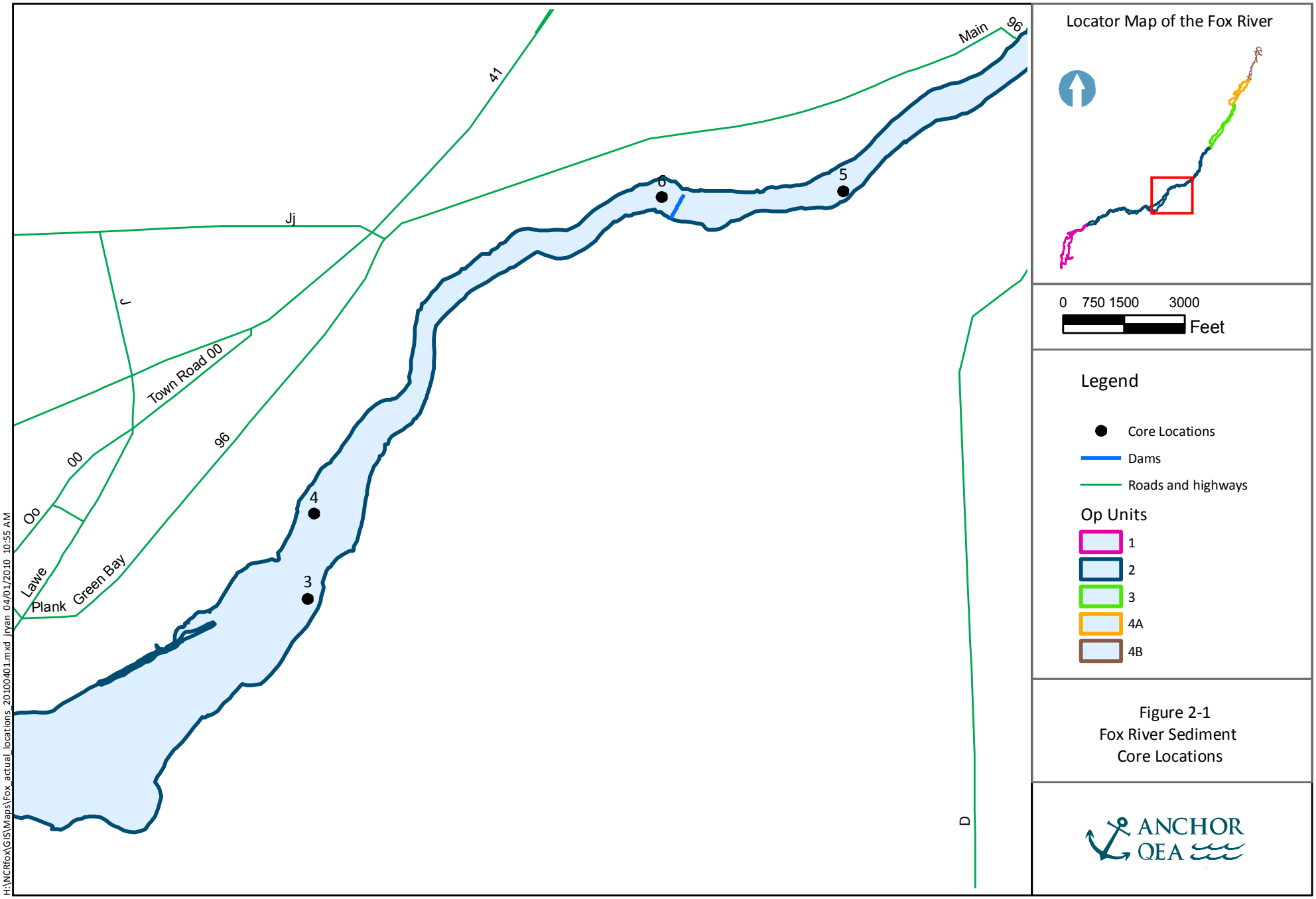
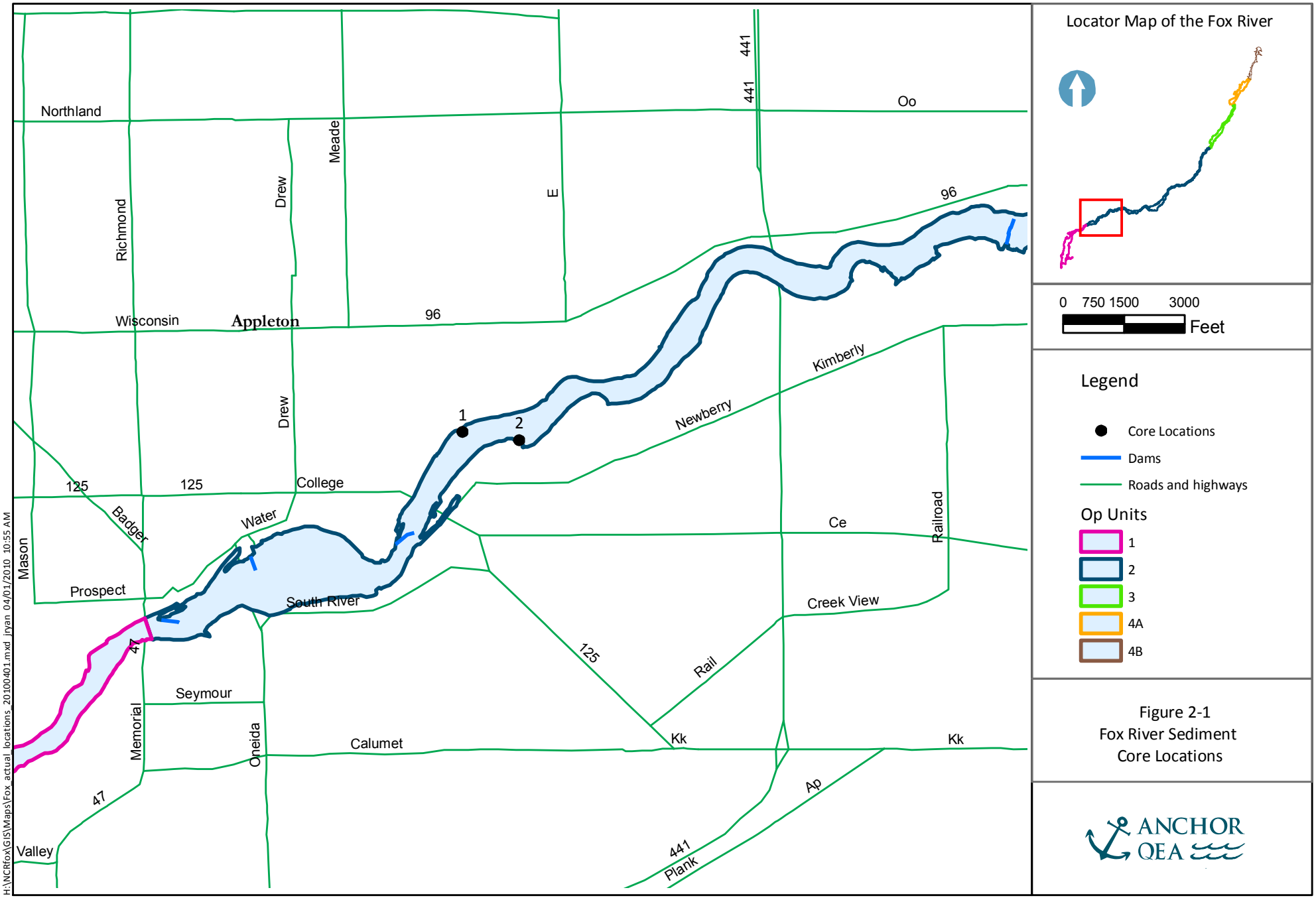

Locator Map of the Fox River
0 750 1500 3000
Feet
Legend
Core Locations
Dams
Roads and highways
Op Units
1
2
3
4A
4B
Figure 2-1
Fox River Sediment
Core Locations
ANCHOR QEA
Main
96
41
Jj
Town Road 00
00
Oo
Lawe
Plank
Green Bay
D
3
4
5
6
H:\NCRfox\GIS\Maps\Fox_actual_locations_20100401.mxd jryan 04/01/2010 10:55 AM


Locator Map of the Fox River
0 750 1500 3000
Feet
Legend
Core Locations
Dams
Roads and highways
Op Units
1
2
3
4A
4B
Figure 2-1
Fox River Sediment
Core Locations
ANCHOR QEA
Northland
Oo
Richmond
Drew
Meade
E
441
96
Wisconsin
Appleton
Kimberly
Newberry
College
125
Badger
Water
Mason
Prospect
South River
Creek View
Railroad
Ce
Rail
Seymour
Memorial
Oneida
Calumet
Kk
Ap
Valley
Plank
47
1
2
H:\NCRfox\GIS\Maps\Fox_actual_locations_20100401.mxd jryan 04/01/2010 10:55 AM

Within OU2 there was insufficient deposition of soft sediments to collect cores that met the target recovery. Four of the locations, S2-3, S2-4, S2-5, and S2-6 could not be attempted due to a lack of boat access as dams and the lock system were not operating at the time of sampling.

Within OU3 the location of S3-1 was moved approximately 2,000-feet upstream to find sufficient soft sediment.

Locations in OU4B had to be shifted closer to shore to find sufficient sediment. In OU4A, the location of S4-1 was moved closer to shore and S4-25 was moved away from shore to find adequate sediment. No core could be obtained at S4-19, so this location was abandoned.

2.2 Core Collection

Sediment cores were collected using a 24-foot research vessel. Target coordinates for each location were programmed into a Trimble Geo-XT GPS unit. The GPS was used to navigate the vessel to within 10 feet of the target locations. Spuds were used to hold the vessel in place once it was in position. The sediment was then probed to identify whether a sufficient amount of soft sediment was available to provide the targeted core recovery (Table 2-1). If probing indicated a sufficient amount of soft sediment was present, then a core was attempted. If insufficient sediment was present, the vessel was relocated within an approximate 50-foot radius of the target coordinates and additional probing was performed to locate sufficient sediment. If adequate sediment was not found after several attempts the location was abandoned.

Once sufficient sediment was found at a target location an attempt was made to collect a sediment core. A Rossfelder P-3 underwater vibrocore with a cellulose acetate butylate (or equivalent) core tube was used for sample collection. Core tube penetration was at least 1-foot greater than the target core length to ensure enough sediment was retained in the core tube for full recovery. Upon reaching the target penetration depth the core was pulled from the sediment and a cap placed on the bottom of the core tube before the end of the tube was brought above the surface of the water. The core was then placed on the deck of the sampling vessel and measured. If the core met or exceeded the target recovery criteria it was

retained. If the recovery was not adequate, the sediment from the core was released back into the river a few feet away downstream from the coring location. The core tube was then rinsed with river water, and core collection was reattempted.

When an acceptable core was collected, any water in the core tube was decanted by drilling a small hole just above the sediment water interface, allowing the water to drain into the river. The core tube was then cut approximately 1-inch above the sediment and capped, sealed with duct tape, and labeled with the station ID, collection date, and time. The capped cores were stored in a vertical position on the sampling vessel until they were sent for field processing. Information such as probing depth, depth of penetration, water depth, length of recovered sample, lithologic descriptions of the core, and other observations were recorded in a field log.

2.3 Core Processing

Sediment cores were sliced in the field into 2-cm segments, beginning at the top of the core and progressing downward throughout the length of the core. Prior to slicing, the core was placed horizontally on a table and a lab recovery length was recorded. Care was taken to minimize disturbance of the core while rotating the core from the vertical position to the horizontal position. The core was then cut lengthwise along each side of the core tube. The upper half of the tube was lifted off, and the sediment was cut into 2-cm segments using disposable plastic utensils. Each 2-cm segment was homogenized and placed in a 4-oz. glass container provided by the laboratory; the 0- to 2-cm and 2- to 4-cm intervals were combined to provide sufficient volume for Quality Assurance/Quality Control (QA/QC) samples. The final segment was sometimes longer than 2 cm, as it is unlikely that a core ended exactly at a 2-cm interval. Depending on the target recovery of a core, select intervals were marked for Stage 1 analysis (generally every 10 cm) while remaining intervals where marked for archive (Table 2-2). To meet the processing schedule, cores with several feet of clay at the bottom of the core were not fully processed. Slicing was limited to approximately 22 cm into the clay layer (generally resulting in three Stage 1 analytical samples), and the remainder of clay was sealed within the original core collection tube to be archived and processed at a later date if necessary. Sample containers and archived core sections were labeled with the core location, core segment interval, sample processing date, and time. Labels were computer-generated

using a field database and printer. A description of the sediment type was recorded for each sample.

Table 2-2
Stage 1 Core Slice Analysis Plan

Start Depth	End Depth	1m Core	2m Core	3m Core	
cm	cm	Screening-PCBs	Screening-PCBs	Screening-PCBs	Totals
0	4				
4	6				
6	8				
8	10				
10	12				
12	14				
14	16				
16	18				
18	20				
20	22				
22	24				
24	26				
26	28				
28	30				
30	32				
32	34				
34	36				
36	38				
38	40				
40	42				
42	44				
44	46				
46	48				
48	50				
50	52				
52	54				
54	56				
56	58				
58	60				

Table 2-2

Stage 1 Core Slice Analysis Plan

Start Depth	End Depth	1m Core	2m Core	3m Core	
cm	cm	Screening-PCBs	Screening-PCBs	Screening-PCBs	Totals
60	62				
62	64				
64	66				
66	68				
68	70				
70	72				
72	74				
74	76				
76	78				
78	80				
80	82				
82	84				
84	86				
86	88				
88	90				
90	92				
92	94				
94	96				
96	98				
98	100				
100	102				
102	104				
104	106				
106	108				
108	110				
110	112				
112	114				
114	116				
116	118				
118	120				
120	122				
122	124				
124	126				

Table 2-2

Stage 1 Core Slice Analysis Plan

Start Depth	End Depth	1m Core	2m Core	3m Core	
cm	cm	Screening-PCBs	Screening-PCBs	Screening-PCBs	Totals
126	128				
128	130				
130	132				
132	134				
134	136				
136	138				
138	140				
140	142				
142	144				
144	146				
146	148				
148	150				
150	152				
152	154				
154	156				
156	158				
158	160				
160	162				
162	164				
164	166				
166	168				
168	170				
170	172				
172	174				
174	176				
176	178				
178	180				
180	182				
182	184				
184	186				
186	188				
188	190				
190	192				

Table 2-2

Stage 1 Core Slice Analysis Plan

Start Depth	End Depth	1m Core	2m Core	3m Core	
cm	cm	Screening-PCBs	Screening-PCBs	Screening-PCBs	Totals
192	194				
194	196				
196	198				
198	200				
200	202				
202	204				
204	206				
206	208				
208	210				
210	212			[redacted]	
212	214				
214	216				
216	218				
218	220				
220	222				
222	224				
224	226				
226	228				
228	230				
230	232			[redacted]	
232	234				
234	236				
236	238				
238	240				
240	242				
242	244				
244	246				
246	248				
248	250				
250	252			[redacted]	
252	254				
254	256				
256	258				

Table 2-2

Stage 1 Core Slice Analysis Plan

Start Depth	End Depth	1m Core	2m Core	3m Core	
cm	cm	Screening-PCBs	Screening-PCBs	Screening-PCBs	Totals
258	260				
260	262				
262	264				
264	266				
266	268				
268	270				
270	272				
272	274				
274	276				
276	278				
278	280				
280	282				
282	284				
284	286				
286	288				
288	290				
290	292				
292	294				
294	296				
296	298				
298	300				
300	302				
302	304				
No. slices per core		10	11	21	
No. cores (2/3 of collec.)		8	15	8	31
No. field samples		80	165	168	
QC samples		16	33	34	
No. analyses		96	198	202	496

Notes:
Filled cells represent core slices analyzed during the screening phase.
Remaining intervals were archived.

After labeling, the sample containers were placed back in the cardboard boxes in which they originally arrived from the laboratory, placed in coolers, and frozen with dry ice. The boxes were then labeled with the sample IDs contained in each box to facilitate future retrieval of samples. All samples were hand delivered to the laboratory (Northeast Analytical, Inc [NEA]) at the end of the field study. Select samples were submitted for analysis and remaining samples were stored in freezers as archive. Equipment that came into contact with sediment, including core tubes, caps, and plastic utensils were disposed of in accordance with applicable federal, state, and local regulations.

2.4 Laboratory Analysis

Laboratory analyses were performed on a subset of cores from OU3 and OU4 (Table 2-1), and of the cores selected for analysis, a subset of segments were submitted for analysis (Table 2-2). Analyses in Stage 1 were limited to screening-level PCBs and moisture content and TOC. A total of 310 samples were submitted for Stage 1 analysis (Table 2-3). After reviewing these results, data gaps were identified and a total of 346 archive samples were submitted for additional screening-level PCB analysis (Stage 2). A total of 178 samples were submitted for ^{137}Cs analysis. Results of these analyses are discussed in Section 3.

Table 2-3
Number of Samples Submitted for Analysis

	Sample Count		
	Screening Level PCBs		
OU	Stage 1	Stage 2	Cs137
OU3	50	50	34
OU4A	183	219	114
OU4B	77	103	30
Total	310	372	178

Notes:
1. Stage 1 samples were initially submitted for analysis.
2. Results of Stage 1 indicate data gaps which required the analysis of archived samples (Stage 2).

QA/QC samples, including blind duplicates, matrix spikes, and equipment blanks were collected at the rate of one per every 20 samples submitted for analysis during Stage 1.

During Stage 1, a total of 29 blind duplicates, 29 matrix spikes, and 20 equipment blanks were submitted for analyses. During Stage 2, a total of 13 blind duplicates, 17 matrix spikes, and 25 equipment blanks were submitted. To provide adequate sample volume for blind duplicate and matrix spike samples, the top two core segments were combined into one sample for each core (i.e., the top sample for each core would be 0 to 4 cm).

2.5 Data Validation

This section summarizes the review of analytical results for 152 sediment samples collected April 12 to 21, June 6 to 7, and September 19 to 20, 2007. Samples were collected by Quantitative Environmental Analysis, LLC (QEA) and submitted to NEA in Schenectady, New York. Samples were analyzed for the following:

- PCB Congeners by Green Bay Mass Balance Analysis
- PCB Aroclors by United States Environmental Protection Agency (USEPA) method 8082
- Total organic carbon (TOC) by EPA method Lloyd Kahn
- Total solids (TS) by USEPA method 3545, section 7.2.1

NEA sample data group (SDG) numbers 08040135, 08040137, 08040160, 08040161, 08040168, 08040198, 08040204, and 08050041 were reviewed in this report. The samples reviewed in this section are presented in Appendix B, Table B-1.

Data Validation and Qualifications

The following comments refer to the laboratory's performance in meeting their QA/QC guidelines. Laboratory results were reviewed following USEPA guidelines using USEPA Contract Laboratory Program National Functional Guidelines for Inorganics Data Review (USEPA 2004) and USEPA Contract Laboratory National Functional Guidelines for Organics Data Review (USEPA 2008) as guidelines, and applying laboratory and method QC criteria as stated in SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998. Unless noted in this report, laboratory results for the samples listed above were within QC criteria.

Field Documentation

Chain of custody documentation was provided to the laboratory at the time of sample receipt.

Holding Times and Sample Preservation

Samples were appropriately preserved and analyzed within holding times with the exception of sample FR-0052-07. This sample was extracted for PCB congeners 27 days past the one year hold time for samples stored in frozen archive. Associated results have been qualified "J" or "UJ" to indicate they are estimated. See Table B-2 for qualified data.

Laboratory Method Blanks

Laboratory method blanks were analyzed at the required frequencies. All method blanks were free of target analytes with the exception of several PCB congeners that were detected at levels between the method detection limits and the method reporting limits. Associated results were either below the detection limit or significantly greater than (>5x) the levels detected in the method blanks with a few exceptions. See Table B-2 for qualified data.

Field Quality Control

Field Blanks

No field blanks were collected in association with this sample set.

Field Duplicates

No field duplicates were collected in association with this sample set.

Surrogate Recoveries

Surrogate recoveries were within laboratory control limits for all surrogates.

Matrix Spike (MS) and Matrix Spike Duplicate (MSD)

MS and MSD samples were analyzed at the required frequencies with the exception of the PCB congener analyses, for which one MS/MSD set was reported. All MS/MSD analyses yielded percent recoveries (%R)s and/or relative percent difference (RPD) values within laboratory control limits with the exceptions of the TOC MS samples associated with lab reports 08040135, 0804137, 0804161, and 08040205. All of these MS %R values were below

laboratory control limits. Associated results have been qualified "J" to indicate a potentially low bias. See Table B-2 for qualified data.

Laboratory Control Sample (LCS)

LCSs were analyzed at the required frequencies and resulted in %R values within laboratory control limits.

Laboratory Duplicates

Laboratory duplicates were analyzed at the required frequencies with the exception of the percent moisture analysis. A total of three duplicates were reported for this analysis. All RPD values were within laboratory control limits.

Analytical Completeness

All requested analyses were performed with the exception of the PCB congener analysis of sample FR-0052-02. The laboratory analyzed sample FR-0052-07 from the same Chain of Custody for PCB congeners which was not requested. Completeness was 99%.

Method Reporting Limits

Reporting limits were deemed acceptable as reported. All values were reported using the laboratory's reporting limits. Values were reported as undiluted, or when diluted, the reporting limit accurately reflects the dilution factor.

Overall Assessment

As was determined by this evaluation, the laboratory followed the specified analytical methods and all requested sample analyses were completed with the exception noted above. Accuracy was acceptable, as demonstrated by the surrogate, LCS, and MS/MSD %R values, with the exceptions noted above. Precision was also acceptable as demonstrated by the laboratory duplicates and MS/MSD RPD values. PCB congener results for one sample were qualified due to a missed hold time. Some PCB congener results were qualified due to method blank contamination. Most data were deemed acceptable as reported; all other data are acceptable as qualified. Table B-2 summarizes the qualifiers applied to samples reviewed in this section.

3 ANALYSIS

3.1 Total PCB Results

Core profiles are presented in Figure 3-1 for total PCBs (Method 8082), congener PCBs and ^{137}Cs. Congener PCBs and ^{137}Cs measurements focused primarily, although not solely, on segments near the peak concentrations. Only cores collected in OU3 and OU4 were analyzed.

A total of 47 cores were collected in OU3 and OU4. Of these, 26 were determined to contain an accurate historical record: 4 in OU3; 18 in OU4A; and 4 in OU4B. These cores exhibited the following characteristics:

- In every case, the highest concentrations are buried beneath the surface. In most cases, nearly the entire inventory of PCBs was sampled, as indicated by low concentrations in the deepest segments.
- The ^{137}Cs data generally exhibit peaks deeper than the PCB peak or at similar depth, indicating that qualitatively, the peak concentrations of PCBs occurred after the mid-1960s. In many cases, the full ^{137}Cs inventory was measured, as indicated by near-zero concentrations in the deepest measured segments. This also supports the conclusion that the cores provide a complete record of historical contamination.
- In general, the congener and Aroclor data produce peaks in the same or nearby depth segments, supporting the realism of the profiles.

3.2 Aroclor 1260 Results

The presence of Aroclor 1260 in Lower Fox River sediments is illustrated in Figure 3-2, which presents congener patterns of Aroclor 1242, Aroclor 1260 and one representative sample from the river. The congener pattern in the field sample is similar to the Aroclor 1242 pattern, but also includes a small amount of higher chlorinated congeners that generally match the pattern in Aroclor 1260 (see inserts in Figure 3-2).

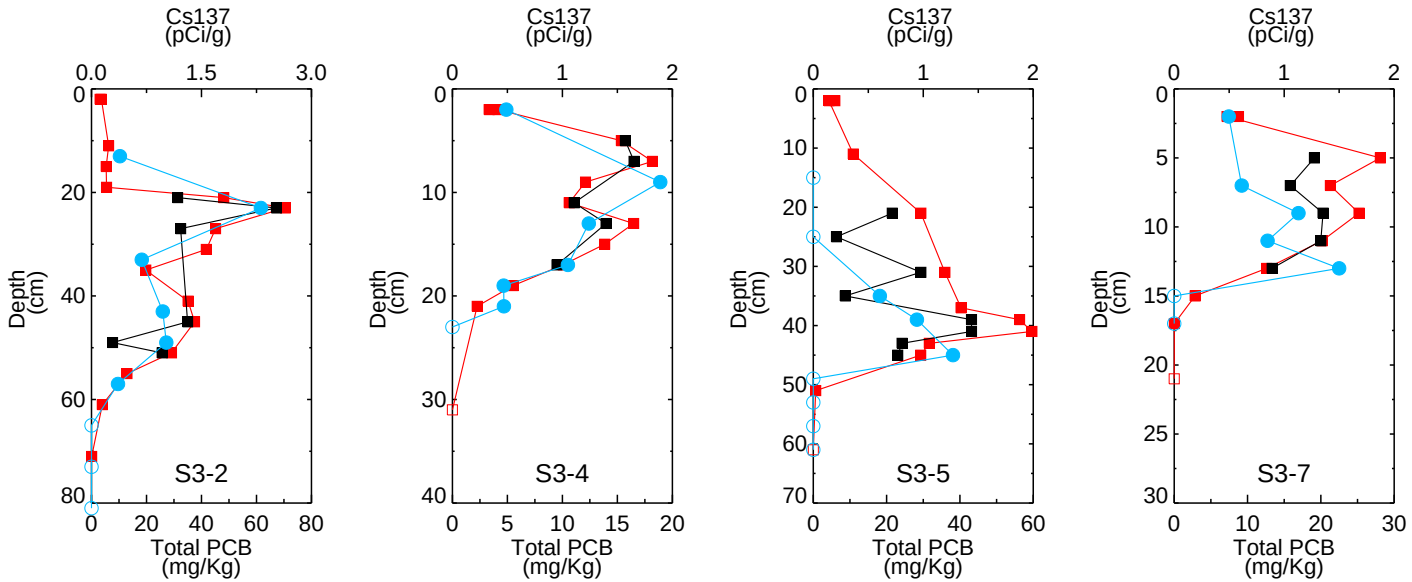


Figure 3-1

Depth profile of dry weight based Total Aroclor PCB, Total Congener PCB and Cesium 137

Non-detects shown as open symbols

ANCHOR QEA

Total Aroclor PCB Total Congener PCB Cesium-137

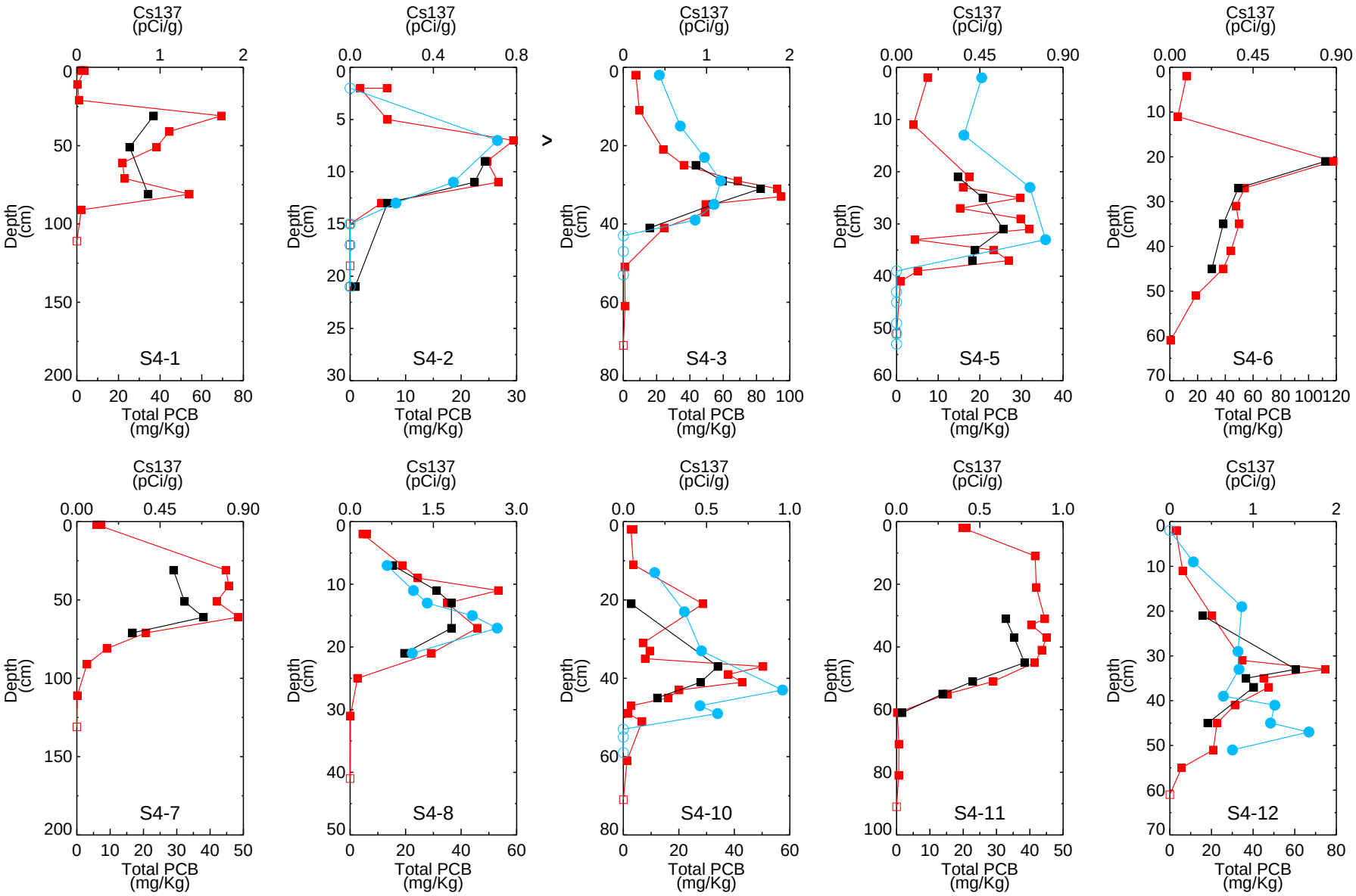


Figure 3-1

Depth profile of dry weight based Total Aroclor PCB, Total Congener PCB and Cesium 137

Non-detects shown as open symbols

ANCHOR QEA

Total Aroclor PCB Total Congener PCB Cesium-137

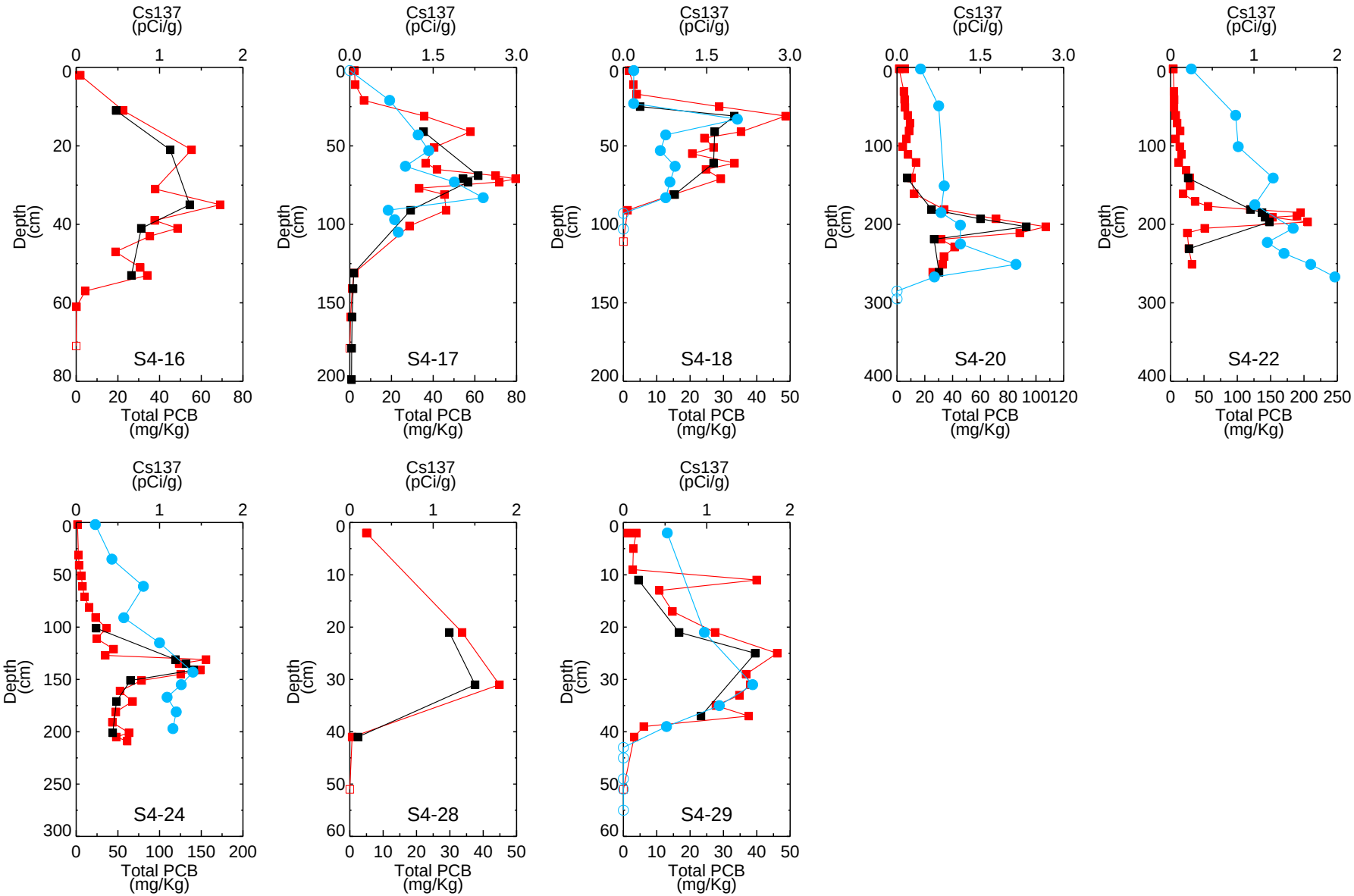


Figure 3-1

Depth profile of dry weight based Total Aroclor PCB, Total Congener PCB and Cesium 137

Non-detects shown as open symbols

ANCHOR QEA

BW - D:\Jobs\NCRfox\Analysis\Allocation\IDL_decks\NewCode\plot_profile_cesium_tpcb_dry_weight.pro Wed Apr 21 14:37:21 2010

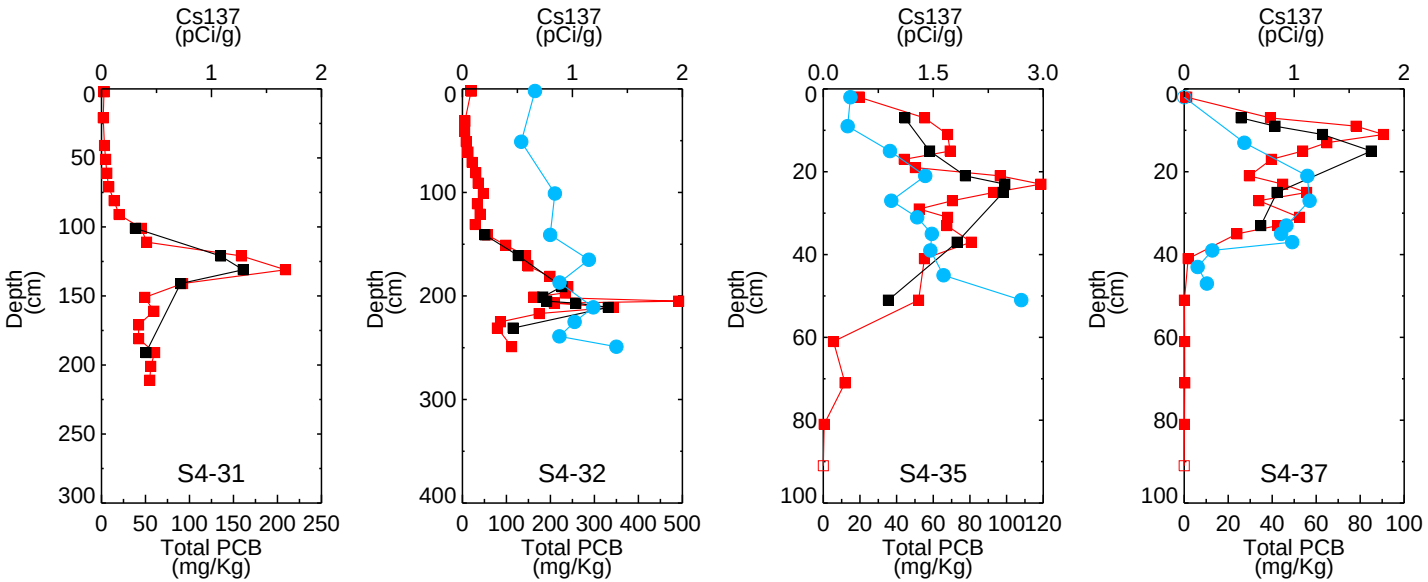


Figure 3-1

Depth profile of dry weight based Total Aroclor PCB, Total Congener PCB and Cesium 137

Non-detects shown as open symbols

Total Aroclor PCB Total Congener PCB Cesium-137

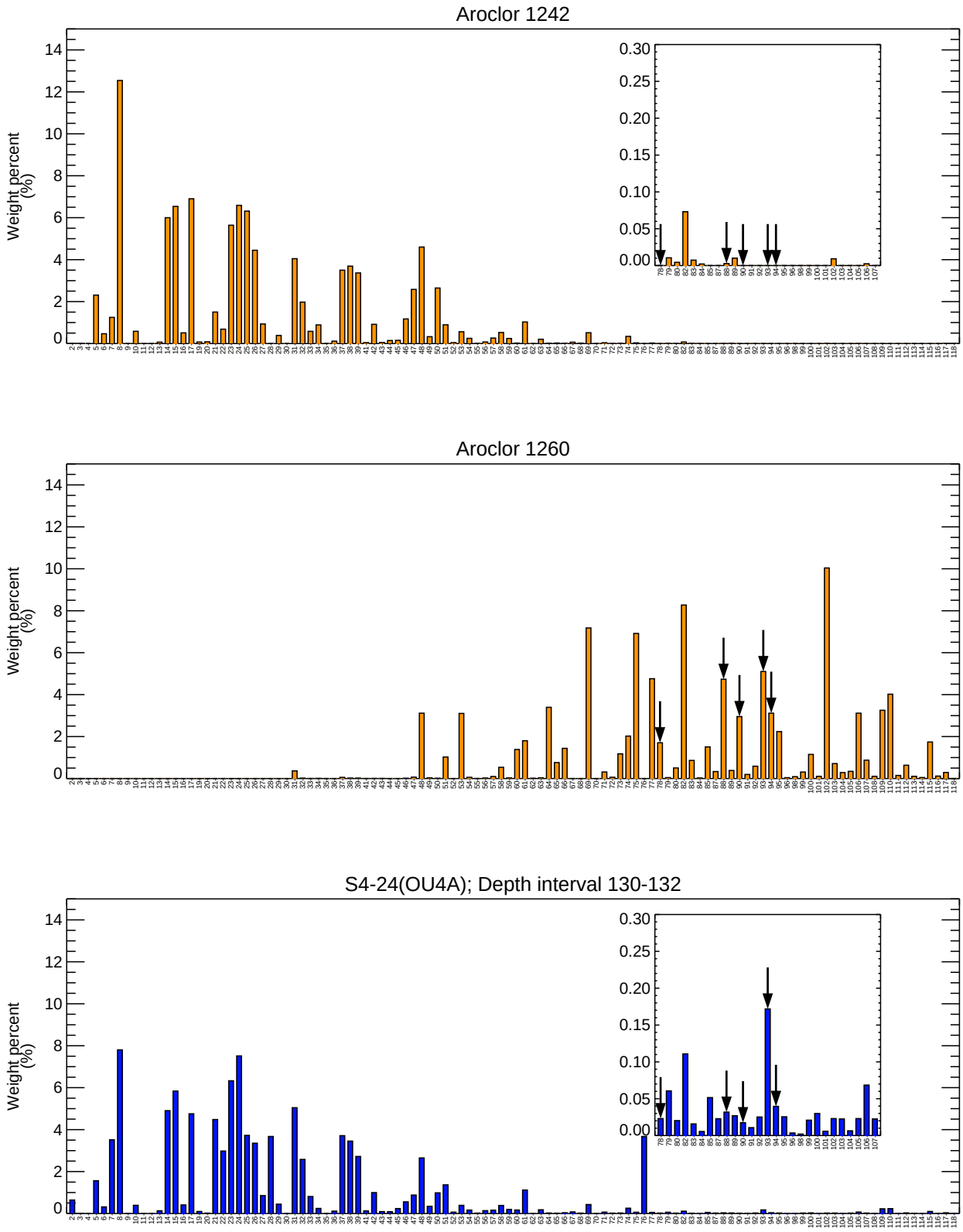


Figure 3-2

Weight percent of congener peaks in Aroclor 1242, Aroclor 1260 and a sample from core S4-24

Arrows indicate characteristic peaks for Aroclor 1260; figure inserts were scaled up from chromatographs

ANCHOR QEA

The concentration of Aroclor 1260 in each sample is estimated using five chromatogram peaks (78 [BZ#179], 88 [BZ#182, 187], 90 [BZ#183], 93 [BZ#174, 181] and 94 [BZ#177]), each of which meets the following criteria: its proportion in Aroclor 1260 is equal to more than 100 times its proportion in Aroclor 1242 and more than ten times its proportion in Aroclor 1254 (Figure 3-2). These five congeners constitute 17.6% of Aroclor 1260. The concentration of Aroclor 1260 in each sample is therefore equal to the summed concentration of these five congeners divided by 0.176.

Figure 3-3 presents vertical profiles of total Aroclor and congener PCB concentrations, as well as Aroclor 1260 concentrations. Concentrations are presented on a carbon-normalized basis. TOC was measured in 80% of the segments for which Aroclor PCB data are available and 96% of the segments for which congener PCB data are available. For the remaining samples, the average carbon content measured in the core was used. The segments chosen to represent the peak concentrations are circled. When more than one segment is selected for a core, results are first averaged by core before further analysis is performed.

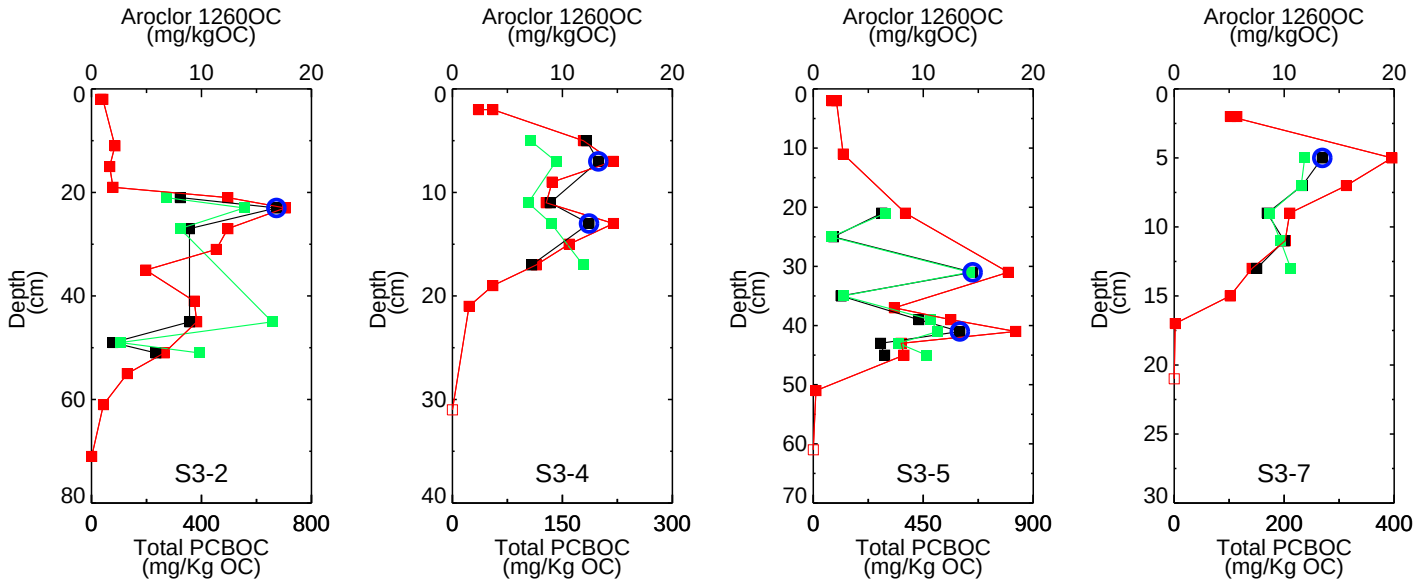


Figure 3-3

Depth profile of carbon normalized Total Aroclor PCB, Total Congener PCB and and concentration of Aroclor 1260

Concentration of Aroclor 1260 is calculated using peaks 78, 88, 90, 93 and 94, with non-detected congener set to half detection limit. Circled were congener peaks included in analysis

Total Aroclor PCB Total Congener PCB Aroclor 1260

BW - D:\Jobs\NCRfox\Analysis\Allocation\IDL_decks\NewCode\plot_profile_aro1260_tpcb_oc.pro Wed Apr 21 14:31:08 2010

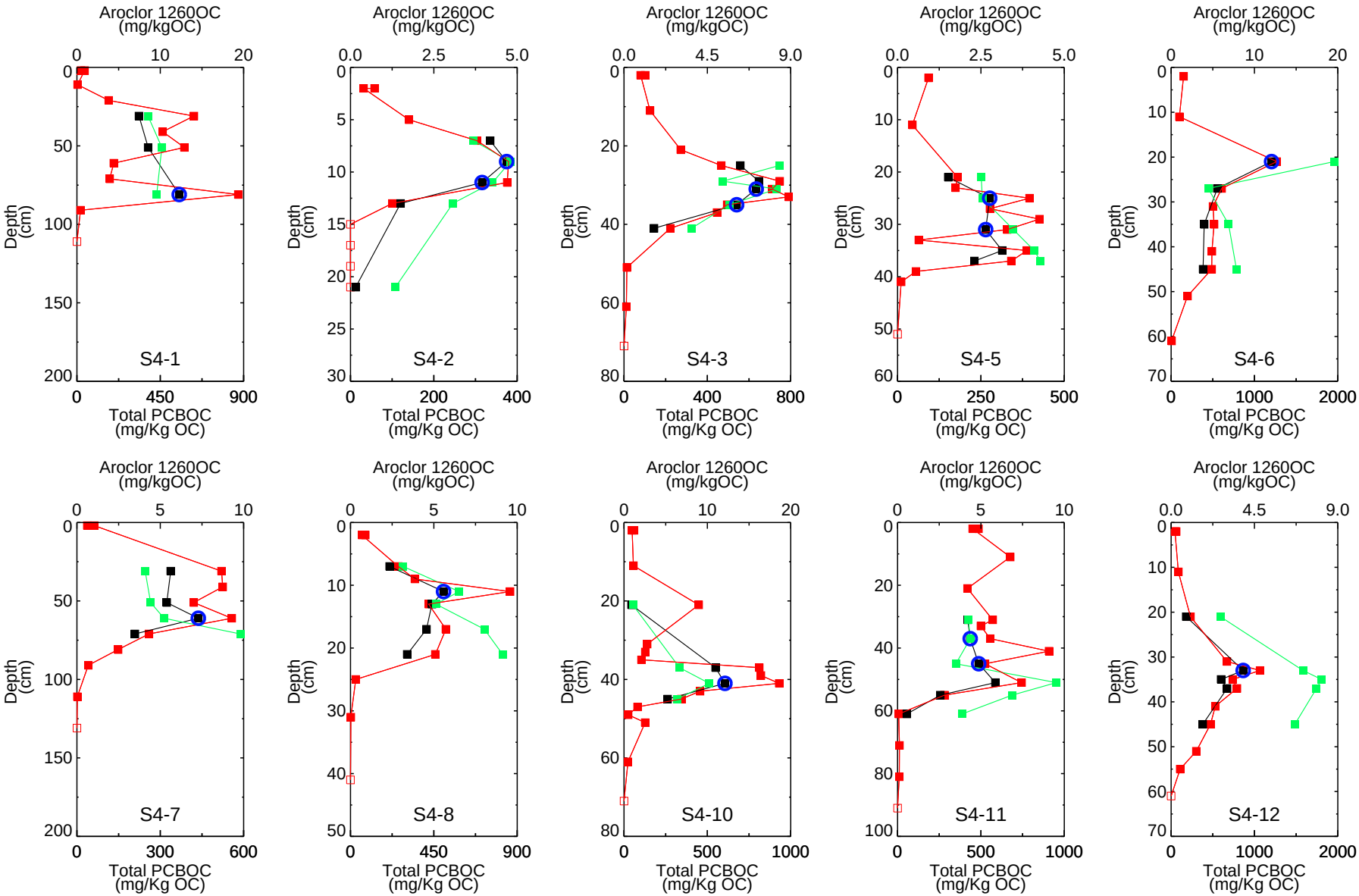


Figure 3-3

Depth profile of carbon normalized Total Aroclor PCB, Total Congener PCB and and concentration of Aroclor 1260

Concentration of Aroclor 1260 is calculated using peaks 78, 88, 90, 93 and 94, with non-detected congener set to half detection limit. Circled were congener peaks included in analysis

Total Aroclor PCB Total Congener PCB Aroclor 1260

ANCHOR QEA

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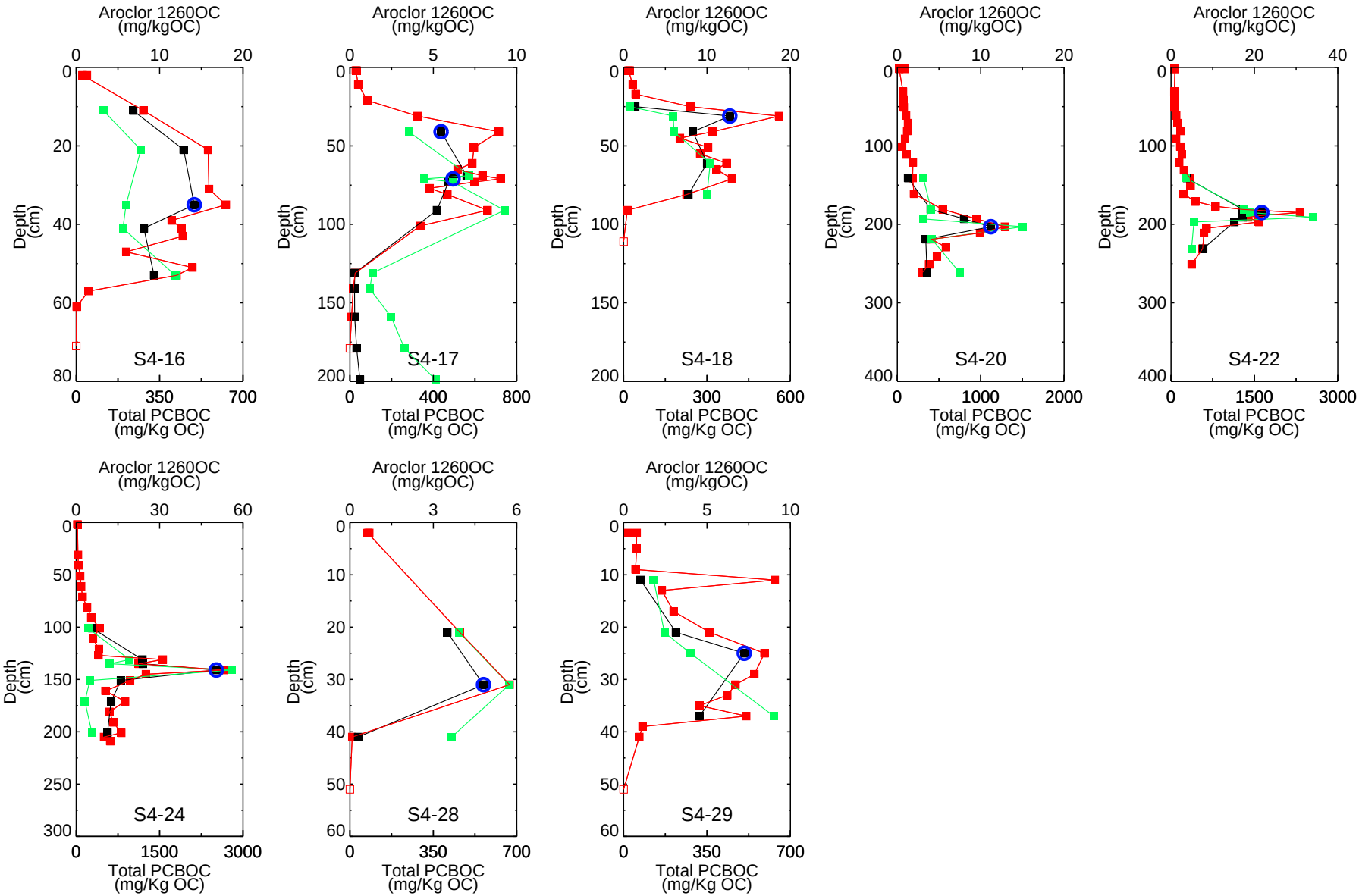

Figure 3-3

Depth profile of carbon normalized Total Aroclor PCB, Total Congener PCB and and concentration of Aroclor 1260

Concentration of Aroclor 1260 is calculated using peaks 78, 88, 90, 93 and 94, with non-detected congener set to half detection limit. Circled were congener peaks included in analysis

ANCHOR QEA

BW - D:\Jobs\NCRfox\Analysis\Allocation\IDL_decks\NewCode\plot_profile_aro1260_tpcb_oc.pro Wed Apr 21 14:31:08 2010

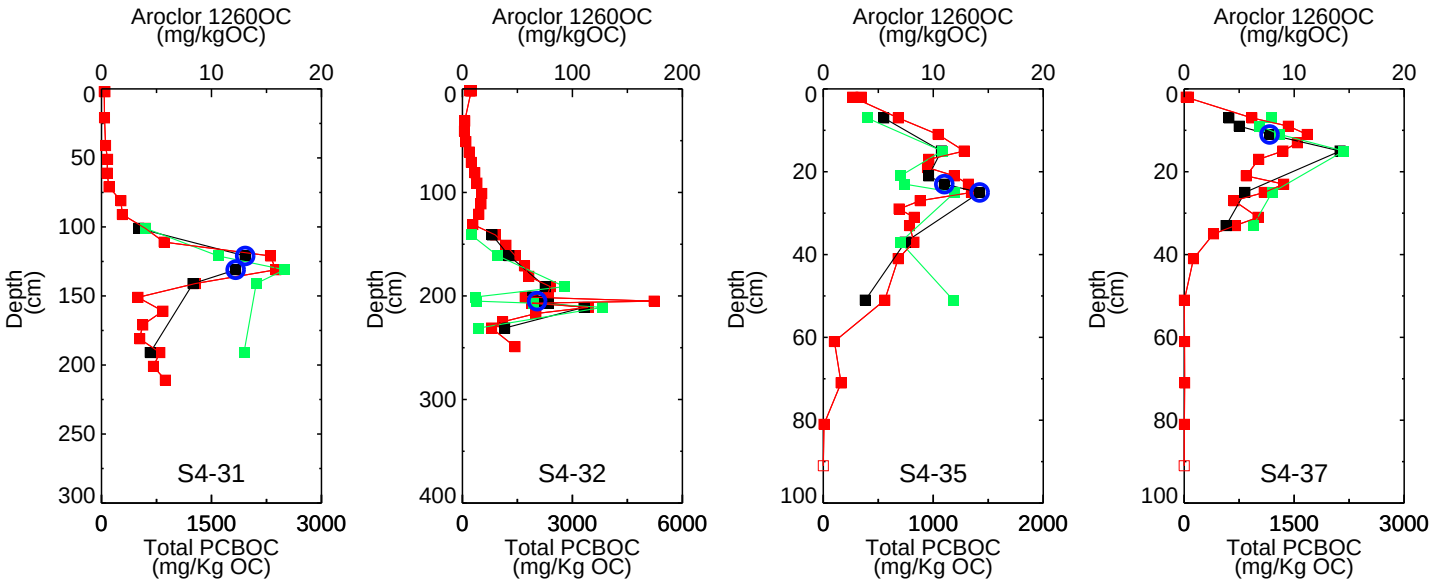

Figure 3-3

Depth profile of carbon normalized Total Aroclor PCB, Total Congener PCB and and concentration of Aroclor 1260

Concentration of Aroclor 1260 is calculated using peaks 78, 88, 90, 93 and 94, with non-detected congener set to half detection limit. Circled were congener peaks included in analysis

Total Aroclor PCB Total Congener PCB Aroclor 1260

BW - D:\Jobs\NCRfox\Analysis\Allocation\IDL_decks\NewCode\plot_profile_aro1260_tpcb_oc.pro Wed Apr 21 14:31:08 2010

3.3 Quantification of Source Contributions

Concentrations and proportions of Aroclor 1260 in each peak segment are presented in Table 3-1. In some cores, two segments were used to represent the peak (Figure 3-3). Core-average values for proportion Aroclor 1260 are presented in Table 3-2. The proportion of Aroclor 1260 decreases with distance downstream (Figure 3-4[4] and Table 3-2), from 0.033 in OU3 to 0.013 in OU4A to 0.0072 in OU4B. This indicates that Aroclor 1242 was released to the river in OU4 and therefore that new sources were present downstream of the dam. The extent of the contribution of upstream sources to PCBs in OU4 was then calculated as follows (Table 3-2):

- For cores with more than one peak segment identified, the proportions Aroclor 1260 of the peaks were averaged.
- The resulting core-specific proportions Aroclor 1260 were averaged for all cores in OU3, all cores in OU4A, and all cores in OU4B.
- The resulting averages were used in the following equations (compare Equation 1):

$$Contribution\ of\ upstream\ sources\ to\ OU4A = \frac{Average\ P1260\ in\ OU4A}{Average\ P1260\ in\ OU3}$$

$$Contribution\ of\ upstream\ sources\ to\ OU4B = \frac{Average\ P1260\ in\ OU4B}{Average\ P1260\ in\ OU3}$$

Resulting estimates of the contribution of upstream sources to PCBs in OU4A and OU4B are presented in Figure 3-5. Our best estimate, to a reasonable degree of scientific certainty, is that upstream sources contributed 38% of the total PCBs in OU4A and 22% of the PCBs in OU4B.

The same approach was used to make a preliminary estimate of the contribution of sources that released PCBs directly to OU4A to PCBs within OU4B. This calculation was performed in two steps. First, the contribution of all sources upstream of OU4B (which includes both sources upstream of Depere Dam as well as sources within OU4A) was calculated:

[4] Location is shown as Northing, which generally aligns with the river, which flows from south to north.

$$Contribution\ of\ sources\ upstream\ of\ OU4B\ to\ OU4B = \frac{Average\ P1260\ in\ OU4B}{Average\ P1260\ in\ OU4A}$$

This is equal to 0.0072 / 0.01278 = 56% (Table 3-2).

Next, the contribution of sources that released directly to OU4A was calculated by subtracting from this value the contribution of sources upstream of Depere Dam to OU4B (22%). Thus, the contribution of sources within OU4A to contamination in OU4B is equal to 56% - 22% = 34%.

Thus, OU4A sources (i.e., U.S. Paper) contributed approximately 62% of the total PCBs in OU4A (100% – 38%) and approximately 34% of the PCBs in OU4B. OU4B sources (i.e., Georgia-Pacific) contributed approximately 44% of the PCBs in OU4B (100% - 22% - 34%). These estimates are qualified as preliminary, because there is some evidence in the sediment samples of upstream movement of PCBs from OU4B sources into 4A. This is not unexpected given the well-documented "seiche" effect in OU4 that produces flow reversals in this area of the river. We have not completed our analysis of the contribution of OU4B sources into OU4A, and therefore in this regard our estimates are preliminary, approximate only, and will likely be further revised as our work progresses.

These estimates of the contribution of upstream PCBs to OU4 may be lower than the true values because of the assumption that no Aroclor 1260 was released directly into OU4.

Table 3-1
Total Congener PCB, Fraction Organic Carbon and Aroclor 1260 of Peak Slices of Cores from the Lower Fox River

Core ID	Start Depth (cm)	Proportion of Aroclor 1260 (--)	Concentration of Aroclor 1260 (ppm)	Fraction Organic Carbon (ppm)	Total Congener PCB (ppm)
S3-2	22	0.0206	13.885	0.1	67.2503
S3-4	6	0.0473	9.42	0.083	16.5179
S3-4	12	0.0482	8.988	0.075	13.9723
S3-5	30	0.0218	14.23	0.045	29.3357
S3-5	40	0.0189	11.326	0.072	43.1669
S3-7	4	0.0441	11.863	0.071	19.1208
S4-1	80	0.0173	9.566	0.062	34.2348
S4-2	8	0.0128	4.795	0.065	24.3523
S4-2	10	0.0135	4.263	0.071	22.4176
S4-3	30	0.013	8.229	0.13	82.4701
S4-3	34	0.0105	5.69	0.1	54.0493
S4-5	24	0.0092	2.543	0.075	20.7282
S4-5	30	0.0131	3.473	0.097	25.6398
S4-6	20	0.0162	19.57	0.093	112.068
S4-7	60	0.012	5.226	0.087	38.0103
S4-8	10	0.013	6.516	0.062	31.1515
S4-10	40	0.0169	10.227	0.046	27.8481
S4-11	36	0.01	4.368	0.081	35.2922
S4-11	44	0.0072	3.497	0.079	38.4447
S4-12	32	0.0082	7.122	0.07	60.5208
S4-16	34	0.0121	5.974	0.11	54.4883
S4-17	40	0.0081	3.529	0.081	35.4088
S4-17	70	0.0091	4.482	0.11	54.3867
S4-18	30	0.0156	5.96	0.087	33.2293
S4-20	202	0.0134	15.043	0.083	93.062
S4-22	184	0.0117	19.06	0.084	137.107
S4-24	140	0.0222	56.002	0.056	141.056
S4-28	30	0.0102	5.733	0.067	37.5668
S4-29	24	0.0079	4.004	0.078	39.4902
S4-31	120	0.0054	10.613	0.069	135.217
S4-31	130	0.0091	16.652	0.088	161

Table 3-1
Total Congener PCB, Fraction Organic Carbon and Aroclor 1260 of Peak Slices of Cores from the Lower Fox River

Core ID	Start Depth (cm)	Proportion of Aroclor 1260 (--)	Concentration of Aroclor 1260 (ppm)	Fraction Organic Carbon (ppm)	Total Congener PCB (ppm)
S4-32	204	0.0064	12.954	0.094	191.497
S4-35	22	0.0067	7.409	0.09	99.0283
S4-35	24	0.0084	11.948	0.069	98.0966
S4-37	10	0.0075	8.701	0.054	62.8693

Table 3-2
Average Proportion Aroclor 1260

River Section	Core ID	Start Depth (cm)	Proportion of Aroclor 1260 (--)	Averaged Portion Aroclor 1260 by River Section
OU3	S3-2	22	0.0206	0.0332
	S3-4	6	0.04775	
	S3-5	30	0.02035	
	S3-7	4	0.0441	
OU4A	S4-1	80	0.0173	0.01278
	S4-2	8	0.01315	
	S4-3	30	0.01175	
	S4-5	24	0.01115	
	S4-6	20	0.0162	
	S4-7	60	0.012	
	S4-8	10	0.013	
	S4-10	40	0.0169	
	S4-11	36	0.0086	
	S4-12	32	0.0082	
	S4-16	34	0.0121	
	S4-17	40	0.0086	
	S4-18	30	0.0156	
	S4-20	202	0.0134	
	S4-22	184	0.0117	
	S4-24	140	0.0222	
	S4-28	30	0.0102	
	S4-29	24	0.0079	
OU4B	S4-31	120	0.00725	0.0072
	S4-32	204	0.0064	
	S4-35	22	0.00755	
	S4-37	10	0.0075	

Contribution of OU3 to OU4A: 38%
Contribution of OU3 to OU4B: 22%

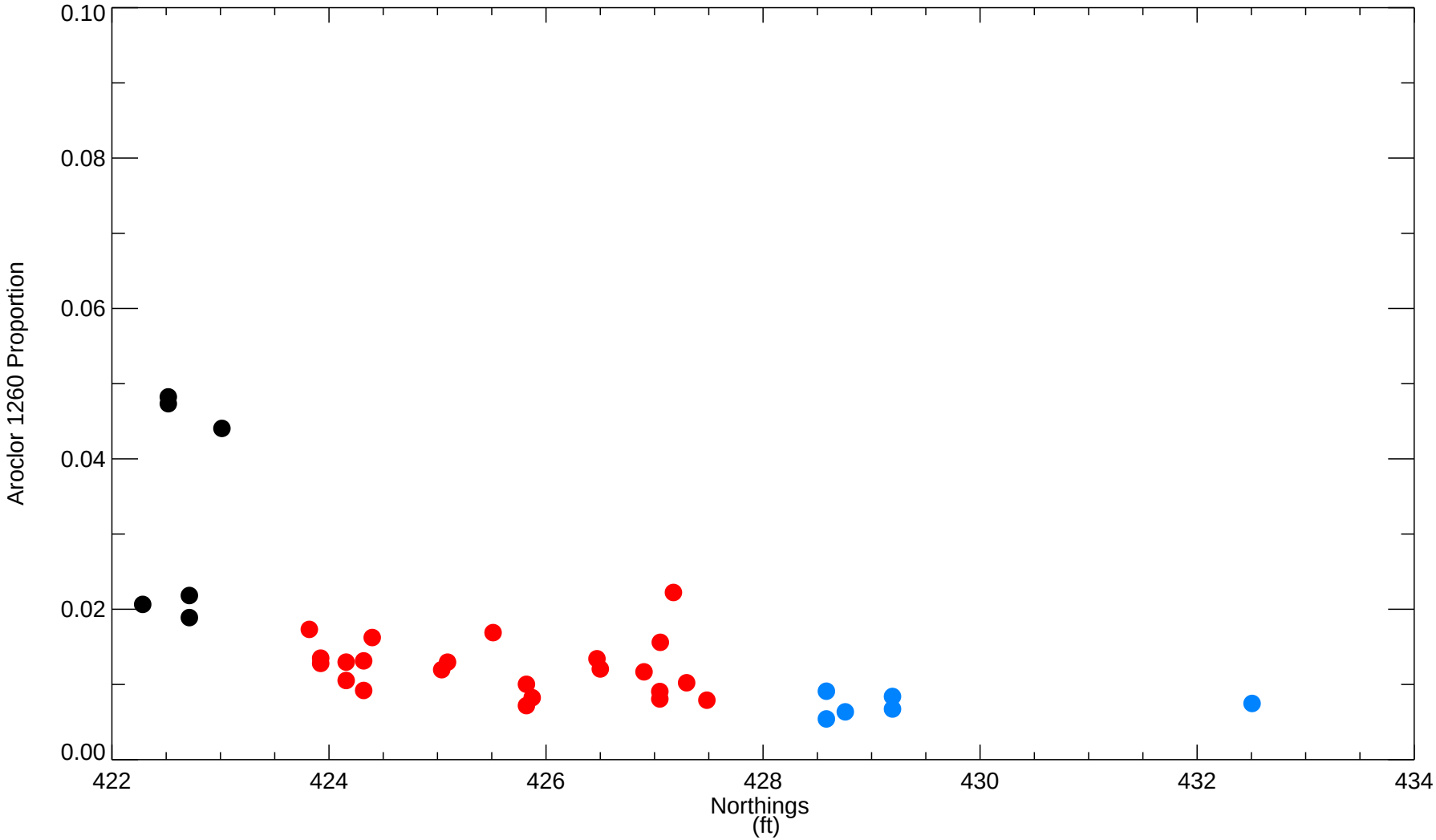

Figure 3-4

Proportion of Aroclor 1260 in sediments from the Lower Fox River: High-Resolution core slices containing peak carbon-normalized Total PCB concentrations

Concentration of Aroclor 1260 is calculated using peaks 78, 88, 90, 93 and 94, with non-detected congener set to half detection limit

ANCHOR QEA

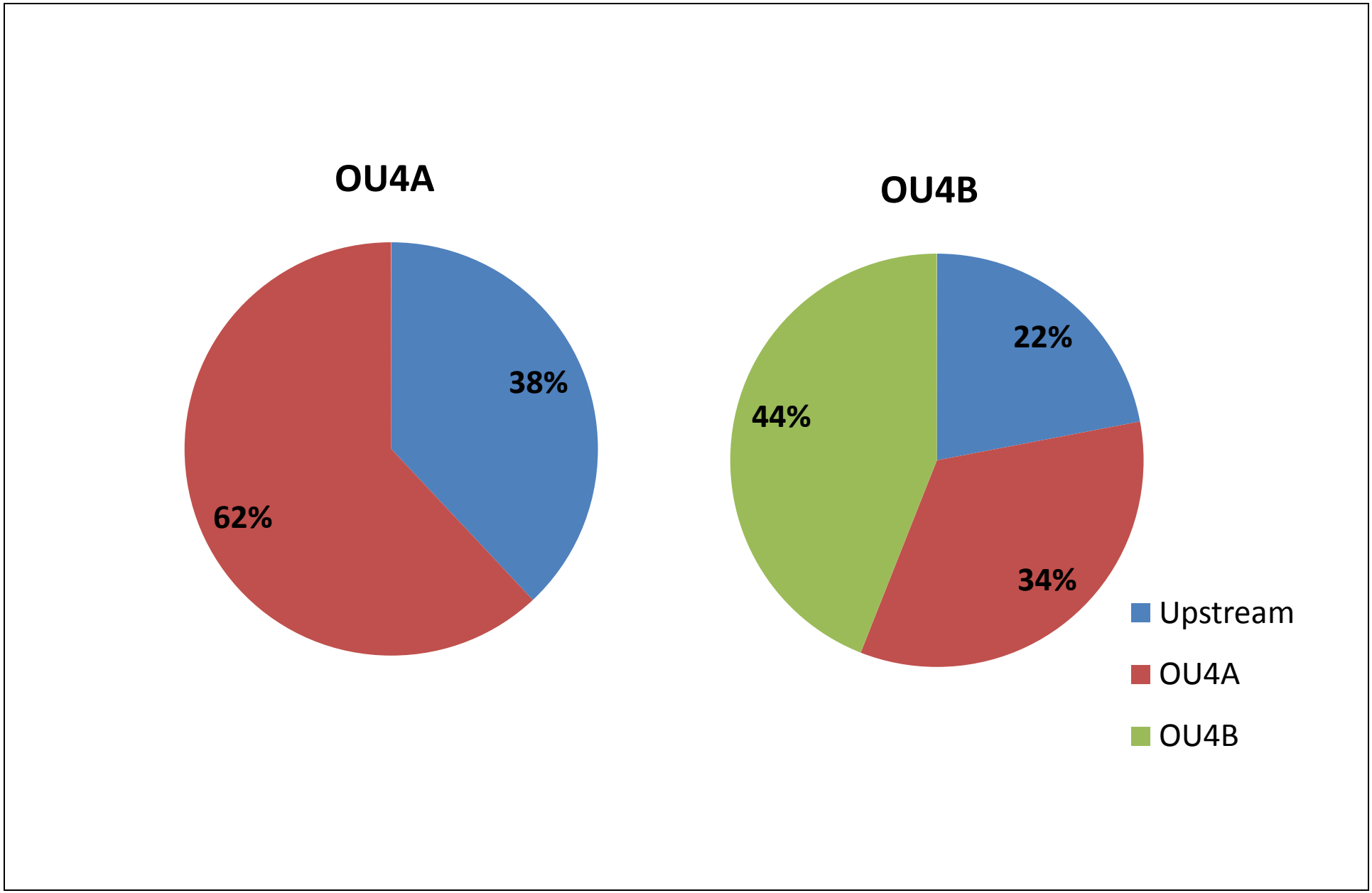

Figure 3-5
Contributions of Upstream Sources to PCBs in the Sediments of Operable Unit 4A and 4B of the Lower Fox River

4 CONCLUSIONS

A conceptually simple, data-based approach was used to estimate the contribution of PCB sources located upstream of the Depere Dam to PCBs present in the sediments of the Lower Fox River below Depere. By the best estimate, upstream sources contributed 38% of the PCBs in OU4A and 22% of the PCBs in OU4B.

5 REFERENCES

USEPA, 2004. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.* U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation (OSRTI). EPA 540-R-04-004. October 2004.

USEPA, 2008. *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review.* U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. USEPA 540-R-08-01. June.

APPENDIX A
DERIVATION OF EQUATION 1

The goal of the analysis is to calculate the relative contribution of total PCB originating upstream of the Depere Dam to total PCB concentrations observed downstream (Equation A-1):

$$Relative\ contribution\ of\ OU3\ = \frac{C_{tPCB,OU4,upst}}{C_{tPCB,OU4}} \qquad \text{Equation A-1}$$

where:

$C_{tPCB,OU4,upst}$ = concentration of tPCB in OU4 sediments contributed from upstream sources

$C_{tPCB,OU3}$ = concentration of tPCB in OU3 sediments

Equation A-1 represents the height of the blue dashed line relative to the height of the pink line at point B on Figure 1-2.

The contribution from upstream ($C_{tPCB,OU4,upst}$), that is, the blue dashed line in Figure 1-2, is given by:

$$C_{tPCB,OU4,upst} = C_{tPCB,OU3} \times D \qquad \text{Equation A-2}$$

where:

D = dilution factor

Combining these equations:

$$Relative\ contribution\ of\ OU3\ = \left(\frac{C_{tPCB,OU3}XD}{C_{tPCB,OU4}}\right) \qquad \text{Equation A-3}$$

We can measure the two concentrations in Equation A-3 in sediment samples from OU3 and OU4. What is needed is an estimate of D, which we developed using the Aroclor 1260 data. An equation can be developed for Aroclor 1260 that is parallel to Equation A-2:

$$C_{12t60,OU4,upst} = C_{1260,OU3} \times D \qquad \text{Equation A-4}$$

where:

$C_{1260,OU4,upst}$	=	concentration of Aroclor 1260 in sediments from OU4 contributed by upstream sources
$C_{1260,OU3}$	=	concentration of Aroclor 1260 in sediments from OU3

This equation can be rearranged:

$$D = \frac{C_{1260,OU4,upst}}{C_{1260,OU3}} \qquad \text{Equation A-5}$$

Here, we assume that Aroclor 1260 only entered the river upstream of the Depere Dam, that is, $C_{1260,OU4,upst} = C_{1260,OU4}$. Then Equation A-5 becomes:

$$D = \frac{C_{1260,OU4}}{C_{1260,OU3}} \qquad \text{Equation A-6}$$

D from Equation A-6 can be used in Equation 3 to estimate the relative contribution of upstream sources to total PCB contamination in OU4. The value of using Equation A-6 is that it can be estimated by simply measuring Aroclor 1260 concentrations in sediment samples from OU3 and OU4.

If some Aroclor 1260 was released into the river in OU4, then $C_{1260,OU4,upst}$ would be less than $C_{1260,OU4}$, which means that the true value of D (Equation A-5) would be lower than the estimated value of D (Equation A-6). Looking at Equation A-3, this would mean that when using Equation A-6, we would overestimate D and therefore overestimate the relative contribution of OU3 to OU4 contamination. Thus, the approach taken here, namely, assuming no Aroclor 1260 releases to the river in OU4, provides an upper-bound estimate of the contributions of upstream sources to PCB concentrations in OU4 sediments.

We can now combine Equations A-3 and A-6 to complete our approach:

$$Relative\ contribution\ of\ OU3 = \left(\frac{C_{tPCB,OU3}}{C_{tPCB,OU4}}\right)\left(\frac{C_{1260,OU4}}{C_{1260,OU3}}\right) \qquad \text{Equation A-7}$$

Rearranging Equation A-7:

$$Relative\ contribution\ of\ OU3 = \left(\frac{C_{1260,OU4}}{C_{tPCB,OU4}}\right) \Big/ \left(\frac{C_{1260,OU3}}{C_{tPCB,OU3}}\right) = P_{1260,OU4} \Big/ P_{1260,OU3} \quad \text{Equation 8}$$

where:

$P_{1260,OU3}$ = proportion of Aroclor 1260 in samples collected in OU3

$P_{1260,OU4}$ = proportion of Aroclor 1260 in samples collected in OU4

This is the same as Equation 1 in the main text of the report. This ratio of proportions provides a measure of the relative contributions of OU3 sources to PCBs present in OU4. The approach taken here involved measuring the proportion Aroclor 1260 in sediment samples from OU3 and OU4 and calculation of these ratios.

APPENDIX B
DATA VALIDATION TABLES

Table B-1

Samples Reviewed During Data Validation

Sample ID	Lab ID	Matrix	Analysis Requested
FR-0114-012	AL06154	Sediment	TOC, TS
FR-0114-013	AL06155	Sediment	PCB Congeners, TOC, TS
FR-0114-015	AL06156	Sediment	PCB Congeners, TS
FR-0114-018	AL06157	Sediment	PCB Congeners, TS
FR-0114-019	AL06158	Sediment	PCB Congeners, TS
FR-0121-07	AL06159	Sediment	PCB Congeners, TS
FR-0121-12	AL06160	Sediment	PCB Congeners, TS
FR-0121-14	AL06161	Sediment	PCB Congeners, TS
FR-0121-19	AL06162	Sediment	PCB Congeners, TS
FR-0012-10	AL06163	Sediment	PCB Congeners, TS
FR-0123-04	AL06164	Sediment	PCB Congeners, TS
FR-0123-08	AL06165	Sediment	PCB Congeners, TS
FR-0123-09	AL06166	Sediment	PCB Congeners, TS
FR-0123-11	AL06167	Sediment	PCB Congeners, TOC, TS
FR-0047-01	AL06168	Sediment	PCB Congeners, TOC, TS
FR-0067-04	AL06169	Sediment	PCB Congeners, TS
FR-0067-06	AL06170	Sediment	PCB Congeners, TS
FR-0067-14	AL06171	Sediment	PCB Congeners, TS
FR-0015-22	AL06172	Sediment	PCB Congeners, TS
FR-0005-17	AL06173	Sediment	PCB Congeners, TS
FR-0125-09	AL06176	Sediment	PCB Congeners, TS
FR-0125-14	AL06177	Sediment	PCB Congeners, TS
FR-0002-10	AL06178	Sediment	PCB Congeners, TS
FR-0002-13	AL06179	Sediment	PCB Congeners, TS
FR-0002-17	AL06180	Sediment	PCB Congeners, TS
FR-0025-02	AL06181	Sediment	PCB Congeners, TS

Sample ID	Lab ID	Matrix	Analysis Requested
FR-0030-02	AL06182	Sediment	PCB Congeners, TS
FR-0066-20	AL06183	Sediment	PCB Congeners, TS
FR-0035-01	AL06184	Sediment	TOC, TS
FR-0035-02	AL06185	Sediment	TOC, TS
FR-0035-03	AL06186	Sediment	TOC, TS
FR-0091-06	AL06187	Sediment	TOC, TS
FR-0091-07	AL06188	Sediment	PCB Congeners, TOC, TS
FR-0091-08	AL06189	Sediment	TOC, TS
FR-0091-09	AL06190	Sediment	PCB Congeners, TOC, TS
FR-0091-10	AL06191	Sediment	TOC, TS
FR-0091-11	AL06192	Sediment	TOC, TS
FR-0091-12	AL06193	Sediment	PCB Congeners, TOC, TS
FR-0091-13	AL06194	Sediment	TOC, TS
FR-0091-18	AL06195	Sediment	PCB Congeners, TS
FR-0029-09	AL06314	Sediment	TOC, TS
FR-0029-14	AL06315	Sediment	PCB Congeners, TS
FR-0029-19	AL06316	Sediment	PCB Congeners, TS
FR-0029-20	AL06317	Sediment	PCB Congeners, TS
FR-0029-21	AL06318	Sediment	PCB Congeners, TS
FR-0019-07	AL06319	Sediment	PCB Congeners, TS
FR-0019-09	AL06320	Sediment	PCB Congeners, TS
FR-0019-10	AL06321	Sediment	PCB Congeners, TS
FR-0019-12	AL06322	Sediment	PCB Congeners, TS
FR-0019-14	AL06323	Sediment	PCB Congeners, TS
FR-0501-11	AL06324	Sediment	PCB Congeners, TS
FR-0504-08	AL06325	Sediment	PCB Congeners, TS
FR-0502-15	AL06326	Sediment	PCB Congeners, TS
FR-0502-18	AL06327	Sediment	PCB Congeners, TS

Sample ID	Lab ID	Matrix	Analysis Requested
FR-0502-20	AL06328	Sediment	PCB Congeners, TS
FR-0056-01	AL06329	Sediment	PCB Congeners, TS
FR-0045-10	AL06330	Sediment	PCB Congeners, TS
FR-0095-01	AL06331	Sediment	PCB Congeners, TS
FR-0024-14	AL06332	Sediment	PCB Congeners, TS
FR-0024-21	AL06333	Sediment	PCB Congeners, TS
FR-0042-05	AL06334	Sediment	TOC, TS
FR-0042-06	AL06335	Sediment	TOC, TS
FR-0042-07	AL06336	Sediment	TOC, TS
FR-0042-08	AL06337	Sediment	PCB Congeners, TOC, TS
FR-0042-09	AL06338	Sediment	TOC, TS
FR-0042-16	AL06339	Sediment	PCB Congeners, TS
FR-0042-17	AL06340	Sediment	PCB Congeners, TS
FR-0042-19	AL06341	Sediment	PCB Congeners, TS
FR0004-09	AL06342	Sediment	PCB Congeners, TS
FR0004-13	AL06343	Sediment	PCB Congeners, TS
FR0004-14	AL06344	Sediment	PCB Congeners, TS
FR-0071-03	AL06345	Sediment	TOC, TS
FR-0071-04	AL06346	Sediment	TOC, TS
FR-0071-05	AL06347	Sediment	PCB Congeners, TS
FR-0027-15	AL06348	Sediment	TOC, TS
FR-0027-16	AL06349	Sediment	TOC, TS
FR-0027-17	AL06350	Sediment	PCB Congeners, TOC, TS
FR-0027-18	AL06351	Sediment	TOC, TS
FR-0027-19	AL06352	Sediment	PCB Congeners, TOC, TS
FR-0027-20	AL06353	Sediment	PCB Congeners, TOC, TS
FR-0077-04	AL06376	Sediment	PCB Congeners, TS
FR-0020-14	AL06377	Sediment	PCB Congeners, TS

Sample ID	Lab ID	Matrix	Analysis Requested
FR-0087-14	AL06378	Sediment	PCB Congeners, TS
FR-0116-01	AL06379	Sediment	PCB Congeners, TS
FR-0055-22	AL06380	Sediment	PCB Congeners, TS
FR-0070-20	AL06381	Sediment	PCB Congeners, TS
FR-0070-21	AL06382	Sediment	PCB Congeners, TS
FR-0129-11	AL06383	Sediment	PCB Congeners, TS
FR-0129-12	AL06384	Sediment	PCB Congeners, TS
FR-0001-15	AL06385	Sediment	PCB Congeners, TS
FR-0001-16	AL06386	Sediment	PCB Congeners, TS
FR-0069-01	AL06387	Sediment	PCB Congeners, TS
FR-0069-02	AL06388	Sediment	PCB Congeners, TS
FR-0069-03	AL06389	Sediment	PCB Congeners, TS
FR-0069-04	AL06390	Sediment	PCB Congeners, TS
FR-0094-07	AL06391	Sediment	PCB Congeners, TS
FR-0094-10	AL06392	Sediment	PCB Congeners, TS
FR-0094-13	AL06393	Sediment	PCB Congeners, TS
FR-0094-14	AL06394	Sediment	PCB Congeners, TS
FR-0094-19	AL06395	Sediment	PCB Congeners, TS
FR-0800-01	AL06556	Sediment	PCB Congeners, PCB Aroclors, TOC, TS
FR-0800-02	AL06557	Sediment	PCB Congeners, PCB Aroclors, TOC, TS
FR-0800-03	AL06558	Sediment	PCB Congeners, PCB Aroclors, TOC, TS
FR-0800-04	AL06559	Sediment	PCB Congeners, PCB Aroclors, TOC, TS
FR-0800-05	AL06560	Sediment	PCB Congeners, PCB Aroclors, TOC, TS
FR-0113-100	AL06609	Sediment	PCB Congeners, TS
FR-0113-102	AL06610	Sediment	PCB Congeners, TS
FR-0113-103	AL06611	Sediment	PCB Congeners, TS
FR-0113-108	AL06612	Sediment	TOC, TS
FR-0052-02	AL06613	Sediment	TOC, TS

Sample ID	Lab ID	Matrix	Analysis Requested
FR-0052-03	AL06614	Sediment	TOC, TS
FR-0052-04	AL06615	Sediment	PCB Congeners, TOC, TS
FR-0052-05	AL06616	Sediment	TOC, TS
FR-0052-06	AL06617	Sediment	PCB Congeners, TOC, TS
FR-0052-07	AL06618	Sediment	PCB Congeners, TOC, TS
FR-0089-12	AL06619	Sediment	PCB Congeners, TS
FR-0089-13	AL06620	Sediment	PCB Congeners, TS
FR-0089-15	AL06621	Sediment	PCB Congeners, TS
FR-0089-19	AL06622	Sediment	PCB Congeners, TS
FR-0089-22	AL06623	Sediment	PCB Congeners, TS
FR-0072-01	AL06624	Sediment	PCB Congeners, TS
FR-0072-03	AL06625	Sediment	PCB Congeners, TS
FR-0131-14	AL06626	Sediment	PCB Congeners, TS
FR-0044-01	AL06627	Sediment	TOC, TS
FR-0053-01	AL06628	Sediment	TOC, TS
FR-0053-06	AL06629	Sediment	TOC, TS
FR-0053-08	AL06630	Sediment	PCB Congeners, TOC, TS
FR-0053-11	AL06631	Sediment	PCB Congeners, TOC, TS
FR-0053-15	AL06632	Sediment	PCB Congeners, TOC, TS
FR-0043-03	AL06633	Sediment	PCB Congeners, TOC, TS
FR-0043-08	AL06634	Sediment	PCB Congeners, TOC, TS
FR-0043-14	AL06635	Sediment	PCB Congeners, TOC, TS
FR-0043-16	AL06636	Sediment	TOC, TS
FR-0043-17	AL06637	Sediment	TOC, TS
FR-0043-19	AL06638	Sediment	TOC, TS
FR-0043-21	AL06639	Sediment	PCB Congeners, TOC, TS
FR-0051-19	AL07556	Sediment	TOC, TS
FR-0129-08	AL07557	Sediment	PCB Congeners, TS

Sample ID	Lab ID	Matrix	Analysis Requested
FR-0607-06	AL07558	Sediment	PCB Congeners, TS
FR-0700-03	AL07559	Sediment	PCB Congeners, TS
FR-0700-04	AL07560	Sediment	PCB Congeners, TS
FR-0700-05	AL07561	Sediment	PCB Congeners, TS
FR-0705-11	AL07562	Sediment	PCB Congeners, TS
FR-0705-20	AL07563	Sediment	PCB Congeners, TS
FR-0606-06	AL07564	Sediment	PCB Congeners, TS
FR-0600-01	AL07565	Sediment	PCB Congeners, TS
FR-0600-03	AL07566	Sediment	PCB Congeners, TS
FR-0600-06	AL07567	Sediment	PCB Congeners, TS
FR-0600-11	AL07568	Sediment	PCB Congeners, TS
FR-0600-13	AL07569	Sediment	PCB Congeners, TS
FR-0605-14	AL07570	Sediment	PCB Congeners, TS
FR-0605-19	AL07571	Sediment	PCB Congeners, TS

Table B-2

Data Qualification Summary

Sample ID	Parameter	Peak #	Analyte	Reported Result	Qualified Result	Reason
FR-0800-02	PCB Congeners	Peak 44	PCBs 58,67,100	0.000621B µg/g	0.000621U µg/g	Method blank contamination
FR-0800-03	PCB Congeners	Peak 10	PCB 19	0.000878 JB µg/g	0.00101U µg/g	Method blank contamination
		Peak 15	PCB 17	0.001085 JB µg/g	0.0133U µg/g	Method blank contamination
		Peak 17	PCBs 16,32	0.001077 JB µg/g	0.0140U µg/g	Method blank contamination
		Peak 21	PCB 26	0.001013 JB µg/g	0.00259U µg/g	Method blank contamination
		Peak 22	PCB 25	0.000452 JB µg/g	0.00115U µg/g	Method blank contamination
		Peak 24	PCBs 28,50	0.002015 JB µg/g	0.0190U µg/g	Method blank contamination
		Peak 26	PCBs 22,51	0.000593 JB µg/g	0.0104U µg/g	Method blank contamination
		Peak 27	PCB 45	0.000932 JB µg/g	0.00320U µg/g	Method blank contamination
		Peak 33	PCBs 38,47	0.001396 JB µg/g	0.00359U µg/g	Method blank contamination
		Peak 34	PCBs 48,75	0.000455 JB µg/g	0.00359U µg/g	Method blank contamination
		Peak 38	PCBs 37,42,59	0.001471 JB µg/g	0.00934U µg/g	Method blank contamination
		Peak 44	PCBs 58,67,100	0.00025 JB µg/g	0.000395U µg/g	Method blank contamination
		Peak 8	PCBs 5,8	0.002286 JB µg/g	0.503U µg/g	Method blank contamination
FR-0800-04	PCB Congeners	Peak 14	PCBs 15,18	0.002205 JB µg/g	0.0118U µg/g	Method blank contamination
		Peak 15	PCB 17	0.002523 JB µg/g	0.0118U µg/g	Method blank contamination
		Peak 17	PCBs 16,32	0.000854 JB µg/g	0.125U µg/g	Method blank contamination
		Peak 25	PCBs 20,21,33,53	0.00183 JB µg/g	0.0127U µg/g	Method blank contamination

Sample ID	Parameter	Peak #	Analyte	Reported Result	Qualified Result	Reason
		Peak 27	PCB 45	0.000597 JB µg/g	0.00285U µg/g	Method blank contamination
		Peak 33	PCBs 38,47	0.000912 JB µg/g	0.00320U µg/g	Method blank contamination
		Peak 34	PCBs 48,75	0.00029 JB µg/g	0.00320U µg/g	Method blank contamination
		Peak 63	PCB 82	0.00018 JB µg/g	0.00141U µg/g	Method blank contamination
		Peak 64	PCB 151	0.000146 JB µg/g	0.00544U µg/g	Method blank contamination
FR-0800-05	PCB Congeners	Peak 15	PCB 17	0.000878 JB µg/g	0.00976U µg/g	Method blank contamination
		Peak 21	PCB 26	0.000612 JB µg/g	0.00190U µg/g	Method blank contamination
		Peak 22	PCB 25	0.000671 JB µg/g	0.000844U µg/g	Method blank contamination
		Peak 24	PCBs 28,50	0.000656 JB µg/g	0.0139U µg/g	Method blank contamination
		Peak 26	PCBs 22,51	0.000585 JB µg/g	0.00765U µg/g	Method blank contamination
		Peak 27	PCB 45	0.00066 JB µg/g	0.00235U µg/g	Method blank contamination
		Peak 33	PCBs 38,47	0.00142 JB µg/g	0.00264U µg/g	Method blank contamination
		Peak 34	PCBs 48,75	0.000528 JB µg/g	0.00264U µg/g	Method blank contamination
		Peak 38	PCBs 37,42,59	0.000877 JB µg/g	0.00686U µg/g	Method blank contamination
		Peak 43	PCBs 57,103	0.000276 JB µg/g	0.180U µg/g	Method blank contamination
		Peak 44	PCBs 58,67,100	0.000343B µg/g	0.000343U µg/g	Method blank contamination
FR-0052-07	PCB Congeners	All Peaks	All TCL Compounds	Various	J or UJ	Sample extracted past hold time
FR-0114-012	Conventionals	---	TOC	110000 mg/kg	110000J mg/kg	Low MS %R
FR-0114-013	Conventionals	---	TOC	63000 mg/kg	63000J mg/kg	Low MS %R

Sample ID	Parameter	Peak #	Analyte	Reported Result	Qualified Result	Reason
FR-0123-11	Conventionals	---	TOC	48000 mg/kg	48000J mg/kg	Low MS %R
FR-0047-01	Conventionals	---	TOC	66000 mg/kg	66000J mg/kg	Low MS %R
FR-0042-05	Conventionals	---	TOC	36000 mg/kg	36000J mg/kg	Low MS %R
FR-0042-06	Conventionals	---	TOC	73000 mg/kg	73000J mg/kg	Low MS %R
FR-0035-01	Conventionals	---	TOC	80000 mg/kg	80000J mg/kg	Low MS %R
FR-0035-02	Conventionals	---	TOC	61000 mg/kg	61000J mg/kg	Low MS %R
FR-0035-03	Conventionals	---	TOC	75000 mg/kg	75000J mg/kg	Low MS %R
FR-0091-06	Conventionals	---	TOC	6300 mg/kg	6300J mg/kg	Low MS %R
FR-0091-07	Conventionals	---	TOC	110000 mg/kg	110000J mg/kg	Low MS %R
FR-0091-08	Conventionals	---	TOC	96000 mg/kg	96000J mg/kg	Low MS %R
FR-0091-09	Conventionals	---	TOC	66000 mg/kg	66000J mg/kg	Low MS %R
FR-0091-10	Conventionals	---	TOC	110000 mg/kg	110000J mg/kg	Low MS %R
FR-0091-11	Conventionals	---	TOC	130000 mg/kg	130000J mg/kg	Low MS %R
FR-0091-12	Conventionals	---	TOC	62000 mg/kg	62000J mg/kg	Low MS %R
FR-0091-13	Conventionals	---	TOC	110000 mg/kg	110000J mg/kg	Low MS %R
FR-0042-07	Conventionals	---	TOC	68000 mg/kg	68000J mg/kg	Low MS %R
FR-0042-08	Conventionals	---	TOC	110000 mg/kg	110000J mg/kg	Low MS %R
FR-0042-09	Conventionals	---	TOC	63000 mg/kg	63000J mg/kg	Low MS %R
FR-0071-03	Conventionals	---	TOC	79000 mg/kg	79000J mg/kg	Low MS %R
FR-0071-04	Conventionals	---	TOC	94000 mg/kg	94000J mg/kg	Low MS %R
FR-0027-15	Conventionals	---	TOC	120000 mg/kg	120000J mg/kg	Low MS %R
FR-0027-16	Conventionals	---	TOC	220000 mg/kg	220000J mg/kg	Low MS %R
FR-0027-17	Conventionals	---	TOC	86000 mg/kg	86000J mg/kg	Low MS %R
FR-0027-18	Conventionals	---	TOC	87000 mg/kg	87000J mg/kg	Low MS %R
FR-0027-19	Conventionals	---	TOC	100000 mg/kg	100000J mg/kg	Low MS %R
FR-0027-20	Conventionals	---	TOC	87000 mg/kg	87000J mg/kg	Low MS %R
FR-0044-01	Conventionals	---	TOC	75000 mg/kg	75000J mg/kg	Low MS %R
FR-0053-01	Conventionals	---	TOC	100000 mg/kg	100000J mg/kg	Low MS %R
FR-0053-06	Conventionals	---	TOC	81000 mg/kg	81000J mg/kg	Low MS %R
FR-0053-08	Conventionals	---	TOC	81000 mg/kg	81000J mg/kg	Low MS %R
FR-0053-11	Conventionals	---	TOC	79000 mg/kg	79000J mg/kg	Low MS %R
FR-0053-15	Conventionals	---	TOC	54000 mg/kg	54000J mg/kg	Low MS %R
FR-0043-03	Conventionals	---	TOC	80000 mg/kg	80000J mg/kg	Low MS %R
FR-0043-08	Conventionals	---	TOC	100000 mg/kg	100000J mg/kg	Low MS %R
FR-0043-14	Conventionals	---	TOC	110000 mg/kg	110000J mg/kg	Low MS %R
FR-0043-16	Conventionals	---	TOC	94000 mg/kg	94000J mg/kg	Low MS %R

Sample ID	Parameter	Peak #	Analyte	Reported Result	Qualified Result	Reason
FR-0043-17	Conventionals	---	TOC	79000 mg/kg mg	79000J mg/kg	Low MS %R
FR-0043-19	Conventionals	---	TOC	90000 mg/kg	90000J mg/kg	Low MS %R
FR-0043-21	Conventionals	---	TOC	81000 mg/kg	81000J mg/kg	Low MS %R

APPENDIX C
DATA LISTING

RIVER_SECTION	LOCATION_ID	START_DEPTH	END_DEPTH	NORTHING	CESIUM_RESULT	CESIUM_QUALIFIER	TOTAL_AROCLOR_PCBS	AROCLOR_PCBS_QUALIFIER	TOC_RESULT	TOC_QUALIFIER	Aroclo_ 1260	Total_Congener_PCB	ISPEAK
OU3	S3-1	0	4	421537.7653			2.6055	J					
OU3	S3-1	10	12	421537.7653				U					
OU3	S3-1	20	22	421537.7653				U					
OU3	S3-1	30	32	421537.7653				U					
OU3	S3-1	40	42	421537.7653				U					
OU3	S3-1	50	52	421537.7653				U					
OU3	S3-1	60	62	421537.7653				U					
OU3	S3-2	0	4	422283.4963			3.429333333	J	87000				
OU3	S3-2	10	12	422283.4963			6.22		73000				
OU3	S3-2	14	16	422283.4963			5.33		80500				
OU3	S3-2	18	20	422283.4963			5.46		70000				
OU3	S3-2	20	22	422283.4963			48.09		97000		0.659773	31.3287	
OU3	S3-2	22	24	422283.4963	2.31	+	70.442		100000		1.38851	67.2503	1
OU3	S3-2	26	28	422283.4963			45.13		91000		0.732492	32.412	
OU3	S3-2	30	32	422283.4963			41.749		92000				
OU3	S3-2	34	36	422283.4963			19.75		100000				
OU3	S3-2	40	42	422283.4963			35.13		94000				
OU3	S3-2	44	46	422283.4963			37.488		98000		1.60941	34.9397	
OU3	S3-2	50	52	422283.4963			29.077		110000		1.07678	25.6969	
OU3	S3-2	54	56	422283.4963			12.888		99000				
OU3	S3-2	60	62	422283.4963			3.911	J	90000				
OU3	S3-2	70	72	422283.4963			0.0618	J	97000				
OU3	S3-3	0	4	422416.4183			2.085	J					
OU3	S3-3	10	12	422416.4183			2.01	J					
OU3	S3-3	20	22	422416.4183			0.36	J					
OU3	S3-3	30	32	422416.4183			0.289	J					
OU3	S3-3	40	42	422416.4183				U					
OU3	S3-3	50	52	422416.4183				U					
OU3	S3-3	60	62	422416.4183				U					
OU3	S3-4	0	4	422519.5131			3.34	J	94000	J			
OU3	S3-4	0	4	422519.5131	0.49	+	4.108	J	74500	J			
OU3	S3-4	4	6	422519.5131			15.36		86000		0.610804	15.7219	
OU3	S3-4	6	8	422519.5131			18.182		83000		0.781824	16.5179	1
OU3	S3-4	8	10	422519.5131	1.89	+	12.1		89000				
OU3	S3-4	10	12	422519.5131			10.62		83000		0.57242	11.0698	
OU3	S3-4	12	14	422519.5131	1.24	+	16.478		75000		0.674077	13.9723	1
OU3	S3-4	14	16	422519.5131			13.844		87000				
OU3	S3-4	16	18	422519.5131	1.05	+	10.05		88000		1.04521	9.50796	
OU3	S3-4	18	20	422519.5131	0.466	+	5.508		100000				
OU3	S3-4	20	22	422519.5131	0.468	+	2.25	J	99000				
OU3	S3-4	30	32	422519.5131				U					
OU3	S3-4	40	42	422519.5131			0.169	J					
OU3	S3-4	50	52	422519.5131				U					
OU3	S3-4	60	62	422519.5131				U					
OU3	S3-4	70	72	422519.5131				U					
OU3	S3-4	80	82	422519.5131				U					
OU3	S3-4	90	92	422519.5131				U					
OU3	S3-5	0	4	422713.5024			4.789333333		45000				
OU3	S3-5	10	12	422713.5024			10.9		89000				
OU3	S3-5	20	22	422713.5024			29.35		500000		0.503814	21.5306	
OU3	S3-5	30	32	422713.5024			35.897		45000		0.640335	29.3357	1

RIVER_SECTION	LOCATION_ID	START_DEPTH	END_DEPTH	NORTHING	CESIUM_RESULT	CESIUM_QUALIFIER	TOTAL_AROCLOR_PCBS	AROCLOR_PCBS_QUALIFIER	TOC_RESULT	TOC_QUALIFIER	Aroclo_ 1260	Total_Congener_PCB	ISPEAK
OU3	S3-5	36	38	422713.5024			40.3		121500				
OU3	S3-5	38	40	422713.5024	0.942	+	56.27		100000		1.06594	43.1481	
OU3	S3-5	40	42	422713.5024			59.63		72000		0.815468	43.1669	1
OU3	S3-5	42	44	422713.5024			31.64		88000		0.682204	24.2074	
OU3	S3-5	44	46	422713.5024	1.27	+	29.3		79000		0.813132	23.0308	
OU3	S3-5	50	52	422713.5024			0.651	J	61000				
OU3	S3-5	60	62	422713.5024	0.0332	U		U					
OU3	S3-5	70	72	422713.5024				U					
OU3	S3-5	80	82	422713.5024				U					
OU3	S3-5	90	92	422713.5024				U					
OU3	S3-6	0	4	422805.5187			0.738	J					
OU3	S3-6	10	12	422805.5187				U					
OU3	S3-6	20	22	422805.5187				U					
OU3	S3-6	30	32	422805.5187				U					
OU3	S3-6	40	42	422805.5187				U					
OU3	S3-6	50	52	422805.5187				U					
OU3	S3-6	60	62	422805.5187				U					
OU3	S3-6	70	72	422805.5187				U					
OU3	S3-6	80	82	422805.5187				U					
OU3	S3-6	90	92	422805.5187				U					
OU3	S3-7	0	4	423013.4051			7.2						
OU3	S3-7	0	4	423013.4051	0.496	+	8.77		77000				
OU3	S3-7	4	6	423013.4051			28.109		71000		0.842285	19.1208	1
OU3	S3-7	6	8	423013.4051	0.614	+	21.294		68000		0.785278	15.8335	
OU3	S3-7	8	10	423013.4051	1.13	+	25.209		120000		1.03657	20.301	
OU3	S3-7	10	12	423013.4051	0.849	+	20.176		100000		0.96693	19.9956	
OU3	S3-7	12	14	423013.4051	1.5	+	12.6117		89000		0.942479	13.3548	
OU3	S3-7	14	16	423013.4051	0.0858	U	2.85		28000				
OU3	S3-7	16	18	423013.4051	0.00474	U	0.0199	J	11000				
OU3	S3-7	20	22	423013.4051				U					
OU3	S3-7	30	32	423013.4051				U					
OU3	S3-7	40	42	423013.4051				U					
OU3	S3-7	50	52	423013.4051				U					
OU3	S3-7	60	62	423013.4051				U					
OU3	S3-7	70	72	423013.4051				U					
OU3	S3-7	80	82	423013.4051				U					
OU3	S3-7	90	92	423013.4051				U					
OU3	S3-8	0	4	422887.1854			0.257	U					
OU3	S3-8	10	12	422887.1854				U					
OU3	S3-8	20	22	422887.1854				U					
OU3	S3-8	30	32	422887.1854				U					
OU3	S3-8	40	42	422887.1854				U					
OU3	S3-8	50	52	422887.1854				U					
OU3	S3-8	60	62	422887.1854				U					
OU3	S3-8	70	72	422887.1854				U					
OU3	S3-8	80	82	422887.1854				U					
OU3	S3-8	90	92	422887.1854				U					
OU4A	S4-1	0	4	423818.915			2.71	J					
OU4A	S4-1	10	12	423818.915			0.309	J					
OU4A	S4-1	20	22	423818.915			1.08	J	6300	J			
OU4A	S4-1	30	32	423818.915			69.433		110000	J	0.937916	36.8372	

RIVER_SECTION	LOCATION_ID	START_DEPTH	END_DEPTH	NORTHING	CESIUM_RESULT	CESIUM_QUALIFIER	TOTAL_AROCLOR_PCBS	AROCLOR_PCBS_QUALIFIER	TOC_RESULT	TOC_QUALIFIER	Aroclo_ 1260	Total_Congener_PCB	ISPEAK
OU4A	S4-1	40	42	423818.915			44.4		96000	J			
OU4A	S4-1	50	52	423818.915			38.29		66000	J	0.672237	25.3628	
OU4A	S4-1	60	62	423818.915			21.889		110000	J			
OU4A	S4-1	70	72	423818.915			22.96		130000	J			
OU4A	S4-1	80	82	423818.915			54.013		62000	J	0.593095	34.2348	1
OU4A	S4-1	90	92	423818.915			2.14	J	110000	J			
OU4A	S4-1	110	112	423818.915				U					
OU4A	S4-10	0	4	425512.1686			3.303333333	J	59500				
OU4A	S4-10	10	12	425512.1686			3.607		64000				
OU4A	S4-10	20	22	425512.1686			28.668		64000		0.0679978	2.87161	
OU4A	S4-10	30	32	425512.1686			7.087		51000				
OU4A	S4-10	32	34	425512.1686	0.469	+	9.56		75000				
OU4A	S4-10	34	36	425512.1686			7.84		75000				
OU4A	S4-10	36	38	425512.1686			50.31		62000		0.412803	34.0467	
OU4A	S4-10	38	40	425512.1686			37.77		46000				
OU4A	S4-10	40	42	425512.1686			42.82		46000		0.470426	27.8481	1
OU4A	S4-10	42	44	425512.1686	0.956	+	20.06		44000				
OU4A	S4-10	44	46	425512.1686			16.184		47000		0.298762	12.2781	
OU4A	S4-10	46	48	425512.1686	0.46	+	2.765		34000				
OU4A	S4-10	48	50	425512.1686	0.566	+	1.69	J	68000				
OU4A	S4-10	50	52	425512.1686			6.72		53000				
OU4A	S4-10	60	62	425512.1686			1.321	J					
OU4A	S4-10	70	72	425512.1686				U					
OU4A	S4-10	80	82	425512.1686				U					
OU4A	S4-10	90	92	425512.1686			0.268	J					
OU4A	S4-10	110	112	425512.1686				U					
OU4A	S4-10	130	132	425512.1686				U					
OU4A	S4-10	150	152	425512.1686				U					
OU4A	S4-11	0	4	425819.6507			20.17		43666.66667				
OU4A	S4-11	10	12	425819.6507			41.601						
OU4A	S4-11	20	22	425819.6507			41.94		100000	J			
OU4A	S4-11	30	32	425819.6507			44.5002		78000		0.331024	32.8042	
OU4A	S4-11	32	34	425819.6507			40.479		81000	J			
OU4A	S4-11	36	38	425819.6507			45.0224		81000	J	0.353799	35.2922	0.5
OU4A	S4-11	40	42	425819.6507			43.601		48000				
OU4A	S4-11	44	46	425819.6507			41.447		79000	J	0.276229	38.4447	0.5
OU4A	S4-11	50	52	425819.6507			29.0041		39000		0.371513	22.8815	
OU4A	S4-11	54	56	425819.6507			15.196		54000	J	0.371004	13.8339	
OU4A	S4-11	60	62	425819.6507			0.205	J	30000		0.115872	1.65753	
OU4A	S4-11	70	72	425819.6507			0.7	J					
OU4A	S4-11	80	82	425819.6507			0.637	J					
OU4A	S4-11	90	92	425819.6507				U					
OU4A	S4-12	0	4	425872.5235			2.889						
OU4A	S4-12	0	4	425872.5235	0.133	U	3.295		54000				
OU4A	S4-12	10	12	425872.5235			6.19		71000				
OU4A	S4-12	20	22	425872.5235			20.2		87000		0.231383	15.7563	
OU4A	S4-12	30	32	425872.5235			34.795		52000				
OU4A	S4-12	32	34	425872.5235	0.831	+	74.688		70000		0.498553	60.5208	1
OU4A	S4-12	34	36	425872.5235			45.1		61000		0.495613	36.5678	
OU4A	S4-12	36	38	425872.5235			47.396		60000		0.47103	40.2944	
OU4A	S4-12	40	42	425872.5235	1.26	+	31.294		59000				

RIVER_SECTION	LOCATION_ID	START_DEPTH	END_DEPTH	NORTHING	CESIUM_RESULT	CESIUM_QUALIFIER	TOTAL_AROCLOR_PCBS	AROCLOR_PCBS_QUALIFIER	TOC_RESULT	TOC_QUALIFIER	Aroclo_ 1260	Total_Congener_PCB	ISPEAK
OU4A	S4-12	44	46	425872.5235	1.21	+	22.674		48000		0.320656	18.215	
OU4A	S4-12	50	52	425872.5235	0.752	+	20.858		69000				
OU4A	S4-12	54	56	425872.5235			5.631		52000				
OU4A	S4-12	60	62	425872.5235				U					
OU4A	S4-12	70	72	425872.5235				U					
OU4A	S4-12	80	82	425872.5235				U					
OU4A	S4-12	90	92	425872.5235				U					
OU4A	S4-12	110	112	425872.5235				U					
OU4A	S4-12	130	132	425872.5235				U					
OU4A	S4-12	150	152	425872.5235				U					
OU4A	S4-13	0	4	426163.6861			0.2515	J					
OU4A	S4-13	10	12	426163.6861				U					
OU4A	S4-13	20	22	426163.6861			0.374	J					
OU4A	S4-13	30	32	426163.6861			1.58	J					
OU4A	S4-13	40	42	426163.6861				U					
OU4A	S4-13	50	52	426163.6861				U					
OU4A	S4-13	60	62	426163.6861				U					
OU4A	S4-14	0	4	426306.3054			0.523	J					
OU4A	S4-14	10	12	426306.3054			25.667						
OU4A	S4-14	16	18	426306.3054				U					
OU4A	S4-14	22	24	426306.3054				U					
OU4A	S4-14	26	28	426306.3054				U					
OU4A	S4-14	30	32	426306.3054			3.124						
OU4A	S4-14	40	42	426306.3054				U					
OU4A	S4-14	50	52	426306.3054				U					
OU4A	S4-14	60	62	426306.3054				U					
OU4A	S4-14	70	72	426306.3054				U					
OU4A	S4-14	80	82	426306.3054				U					
OU4A	S4-14	90	92	426306.3054				U					
OU4A	S4-15	0	4	426450.8889			0.6022	J	40333.33333				
OU4A	S4-15	20	22	426450.8889			0.38	J	30000				
OU4A	S4-15	30	32	426450.8889			2.851		41000				
OU4A	S4-15	40	42	426450.8889			3.184		58000				
OU4A	S4-15	50	52	426450.8889			0.196	J	51000				
OU4A	S4-15	60	62	426450.8889			7.6122		59000				
OU4A	S4-15	70	72	426450.8889				U	20000				
OU4A	S4-15	80	82	426450.8889				U	31000				
OU4A	S4-16	0	4	426500.0251			1.723766667	J	48333.33333	J			
OU4A	S4-16	10	12	426500.0251			22.54		80000	J	0.26048	19.1074	
OU4A	S4-16	20	22	426500.0251			55.346		100000	J	0.774722	45.0898	
OU4A	S4-16	30	32	426500.0251			37.8859		68000	J			
OU4A	S4-16	34	36	426500.0251			69.074		110000	J	0.65712	54.4883	1
OU4A	S4-16	38	40	426500.0251			37.658		94000	J			
OU4A	S4-16	40	42	426500.0251			48.626		110000	J	0.616306	31.2171	
OU4A	S4-16	42	44	426500.0251			35.338		79000	J			
OU4A	S4-16	46	48	426500.0251			18.884		90000	J			
OU4A	S4-16	50	52	426500.0251			30.703		63000	J			
OU4A	S4-16	52	54	426500.0251			34.11		81000	J	0.963701	26.4719	
OU4A	S4-16	56	58	426500.0251			4.334		83500	J			
OU4A	S4-16	60	62	426500.0251			0.135	J					
OU4A	S4-16	70	72	426500.0251				U					

RIVER_SECTION	LOCATION_ID	START_DEPTH	END_DEPTH	NORTHING	CESIUM_RESULT	CESIUM_QUALIFIER	TOTAL_AROCLOR_PCBS	AROCLOR_PCBS_QUALIFIER	TOC_RESULT	TOC_QUALIFIER	Aroclo_ 1260	Total_Congener_PCB	ISPEAK
OU4A	S4-16	80	82	426500.0251			1.97	J					
OU4A	S4-16	90	92	426500.0251				U					
OU4A	S4-17	0	4	427048.7049			2.26	J					
OU4A	S4-17	0	4	427048.7049	0.102	U	2.027	J	64000				
OU4A	S4-17	10	12	427048.7049			2.59	J	65000				
OU4A	S4-17	20	22	427048.7049	0.717	+	6.79		82000				
OU4A	S4-17	30	32	427048.7049			35.672		110000				
OU4A	S4-17	40	42	427048.7049			57.9		81000		0.285825	35.4088	1
OU4A	S4-17	50	52	427048.7049			40.451		68000				
OU4A	S4-17	60	62	427048.7049			36.386		62000				
OU4A	S4-17	64	66	427048.7049			41.831		81000				
OU4A	S4-17	68	70	427048.7049			69.98		110000		0.786368	61.5883	
OU4A	S4-17	70	72	427048.7049			79.53		110000		0.493021	54.3867	1
OU4A	S4-17	72	74	427048.7049	1.88	+	71.71		120000		0.739572	56.7336	
OU4A	S4-17	76	78	427048.7049			33.26		87000				
OU4A	S4-17	80	82	427048.7049			45.36		97000				
OU4A	S4-17	90	92	427048.7049	0.691	+	46.21		70000		0.648381	29.1997	
OU4A	S4-17	100	102	427048.7049			28.65		85000				
OU4A	S4-17	130	132	427048.7049			2.042	J	81000		0.109459	1.86273	
OU4A	S4-17	140	142	427048.7049			1.15	J	72000		0.0853674	1.59302	
OU4A	S4-17	158	160	427048.7049			0.3887	J	48000		0.118852	1.10145	
OU4A	S4-17	178	180	427048.7049				U	28000		0.0916439	0.899578	
OU4A	S4-17	198	200	427048.7049			0.169	J	17000		0.0872583	0.814725	
OU4A	S4-18	0	4	427053.1932			1.64	J					
OU4A	S4-18	0	4	427053.1932	0.186	+	2.296	J	105000				
OU4A	S4-18	10	12	427053.1932			2.982		91000				
OU4A	S4-18	16	18	427053.1932			3.986		250000				
OU4A	S4-18	24	26	427053.1932			28.711		120000		0.0876637	5.00169	
OU4A	S4-18	30	32	427053.1932			48.628		87000		0.518477	33.2293	1
OU4A	S4-18	40	42	427053.1932			35.271		110000		0.663677	27.372	
OU4A	S4-18	44	46	427053.1932			24.29		120000				
OU4A	S4-18	50	52	427053.1932			27.03		89000				
OU4A	S4-18	54	56	427053.1932			20.645		75000				
OU4A	S4-18	60	62	427053.1932			33.32		90000		0.934487	27.0358	
OU4A	S4-18	64	66	427053.1932			24.745		74000				
OU4A	S4-18	70	72	427053.1932			29.21		75000				
OU4A	S4-18	80	82	427053.1932			14.9279		66000	J	0.659628	15.3808	
OU4A	S4-18	90	92	427053.1932			1.23	J					
OU4A	S4-18	110	112	427053.1932				U					
OU4A	S4-2	0	4	423923.4715			1.804	J					
OU4A	S4-2	0	4	423923.4715	0.0455	U	6.65		115000				
OU4A	S4-2	4	6	423923.4715			6.73		48000				
OU4A	S4-2	6	8	423923.4715	0.708	+	29.4171		97000		0.357778	32.5145	
OU4A	S4-2	8	10	423923.4715			24.675		65000		0.311684	24.3523	1
OU4A	S4-2	10	12	423923.4715	0.496	+	26.699		71000		0.30268	22.4176	1
OU4A	S4-2	12	14	423923.4715	0.22	+	5.62		56000		0.171928	6.73419	
OU4A	S4-2	14	16	423923.4715	0.066	U		U	20000				
OU4A	S4-2	16	18	423923.4715	0.0182	U		U	9700				
OU4A	S4-2	18	20	423923.4715				U	35000				
OU4A	S4-2	20	22	423923.4715	0.0103	U		U			0.0974205	0.905383	
OU4A	S4-2	30	32	423923.4715				U					

RIVER_SECTION	LOCATION_ID	START_DEPTH	END_DEPTH	NORTHING	CESIUM_RESULT	CESIUM_QUALIFIER	TOTAL_AROCLOR_PCBS	AROCLOR_PCBS_QUALIFIER	TOC_RESULT	TOC_QUALIFIER	Aroclo_ 1260	Total_Congener_PCB	ISPEAK
OU4A	S4-2	40	42	423923.4715				U					
OU4A	S4-2	50	52	423923.4715				U					
OU4A	S4-2	60	62	423923.4715				U					
OU4A	S4-2	70	72	423923.4715				U					
OU4A	S4-2	80	82	423923.4715				U					
OU4A	S4-2	90	92	423923.4715				U					
OU4A	S4-2	100	102	423923.4715				U					
OU4A	S4-20	0	4	426469.4566			1.533	J	69000				
OU4A	S4-20	0	4	426469.4566	0.424	+	5.498		63500				
OU4A	S4-20	30	32	426469.4566			4.986						
OU4A	S4-20	40	42	426469.4566			5.38						
OU4A	S4-20	50	52	426469.4566			5.698						
OU4A	S4-20	60	62	426469.4566			7.65						
OU4A	S4-20	70	72	426469.4566			9.367						
OU4A	S4-20	80	82	426469.4566			8.616						
OU4A	S4-20	90	92	426469.4566			6.793						
OU4A	S4-20	100	102	426469.4566			4.18						
OU4A	S4-20	110	112	426469.4566			7.872						
OU4A	S4-20	120	122	426469.4566			13.66						
OU4A	S4-20	140	142	426469.4566			10.281		56000		0.17501	7.23209	
OU4A	S4-20	160	162	426469.4566			12.396		62000				
OU4A	S4-20	180	182	426469.4566			33.79		62000		0.251014	24.8706	
OU4A	S4-20	192	194	426469.4566			71.31		75000		0.233489	60.0388	
OU4A	S4-20	202	204	426469.4566			107.04		83000		1.24856	93.062	1
OU4A	S4-20	210	212	426469.4566			88.3		89000				
OU4A	S4-20	218	220	426469.4566			31.719		78000		0.324042	26.6566	
OU4A	S4-20	228	230	426469.4566			41.421		71000				
OU4A	S4-20	240	242	426469.4566			33.73		71000				
OU4A	S4-20	250	252	426469.4566	2.14	+	32.72		86000				
OU4A	S4-20	260	262	426469.4566			25.692		85000		0.632866	30.2441	
OU4A	S4-22	0	4	426902.9847			4.159		59000				
OU4A	S4-22	0	4	426902.9847	0.248	+	3.517		55000				
OU4A	S4-22	30	32	426902.9847			4.998						
OU4A	S4-22	40	42	426902.9847			5.283						
OU4A	S4-22	50	52	426902.9847			5.078						
OU4A	S4-22	60	62	426902.9847	0.78	+	7.754						
OU4A	S4-22	70	72	426902.9847			9.786						
OU4A	S4-22	80	82	426902.9847			14.321						
OU4A	S4-22	90	92	426902.9847			7.473						
OU4A	S4-22	100	102	426902.9847	0.811	+	13.76						
OU4A	S4-22	110	112	426902.9847			16.25						
OU4A	S4-22	120	122	426902.9847			12.19						
OU4A	S4-22	130	132	426902.9847			23.21		100000				
OU4A	S4-22	140	142	426902.9847	1.23	+	28.511				0.330532	26.2726	
OU4A	S4-22	150	152	426902.9847			29.26						
OU4A	S4-22	160	162	426902.9847			18.66		84000				
OU4A	S4-22	170	172	426902.9847			36.656		84000				
OU4A	S4-22	176	178	426902.9847			56.21		70000				
OU4A	S4-22	180	182	426902.9847			119.2383		93000		1.63443	119.999	
OU4A	S4-22	184	186	426902.9847			194.85		84000		1.60103	137.107	1
OU4A	S4-22	188	190	426902.9847			189.64		120000				

RIVER_SECTION	LOCATION_ID	START_DEPTH	END_DEPTH	NORTHING	CESIUM_RESULT	CESIUM_QUALIFIER	TOTAL_AROCLOR_PCBS	AROCLOR_PCBS_QUALIFIER	TOC_RESULT	TOC_QUALIFIER	Aroclo_ 1260	Total_Congener_PCB	ISPEAK
OU4A	S4-22	190	192	426902.9847			152.416		110000		3.74604	141.601	
OU4A	S4-22	196	198	426902.9847			205.45		130000		0.713674	147.926	
OU4A	S4-22	204	206	426902.9847	1.47	+	51.1		80000				
OU4A	S4-22	210	212	426902.9847			24.913		42000				
OU4A	S4-22	230	232	426902.9847			27.302		48000	J	0.236661	27.7558	
OU4A	S4-22	250	252	426902.9847	1.68	+	32.027		86000				
OU4A	S4-24	0	4	427174.0444			1.59	J	70000				
OU4A	S4-24	0	4	427174.0444	0.229	+	1.67	J	79500				
OU4A	S4-24	30	32	427174.0444			2.662	J					
OU4A	S4-24	40	42	427174.0444			3.457	J					
OU4A	S4-24	50	52	427174.0444			6.089						
OU4A	S4-24	60	62	427174.0444	0.806	+	7.55						
OU4A	S4-24	70	72	427174.0444			9.9						
OU4A	S4-24	80	82	427174.0444			15.477		80000				
OU4A	S4-24	90	92	427174.0444	0.571	+	23.23						
OU4A	S4-24	100	102	427174.0444			36.22				0.355111	23.86	
OU4A	S4-24	110	112	427174.0444			24.61		82000				
OU4A	S4-24	120	122	427174.0444			44.92		110000				
OU4A	S4-24	126	128	427174.0444			34.849		87000				
OU4A	S4-24	130	132	427174.0444			155.66		100000		1.91767	118.994	
OU4A	S4-24	134	136	427174.0444			123.43		110000		1.33317	131.84	
OU4A	S4-24	140	142	427174.0444			148.68		56000		3.1361	141.056	1
OU4A	S4-24	144	146	427174.0444			125.346		100000				
OU4A	S4-24	150	152	427174.0444			78.43		81000		0.396677	65.0562	
OU4A	S4-24	160	162	427174.0444			52.5		100000				
OU4A	S4-24	170	172	427174.0444			67.62		77000		0.239348	48.2734	
OU4A	S4-24	180	182	427174.0444	1.2	+	47.6		80000				
OU4A	S4-24	190	192	427174.0444			43.31		65000				
OU4A	S4-24	200	202	427174.0444			63.16		78000		0.44068	43.7989	
OU4A	S4-24	204	206	427174.0444			47.991		96000				
OU4A	S4-24	208	210	427174.0444			61.093		100000				
OU4A	S4-25	0	4	426640.9936			1.161	J	29333.33333				
OU4A	S4-25	20	22	426640.9936			8.17		42000				
OU4A	S4-25	30	32	426640.9936				U	25000				
OU4A	S4-25	40	42	426640.9936				U	11000				
OU4A	S4-25	50	52	426640.9936				U	3100				
OU4A	S4-25	60	62	426640.9936				U	9500				
OU4A	S4-25	70	72	426640.9936				U	7000				
OU4A	S4-25	80	82	426640.9936				U	15000				
OU4A	S4-26	0	4	426767.8306				U					
OU4A	S4-26	30	32	426767.8306				U					
OU4A	S4-26	40	42	426767.8306				U					
OU4A	S4-26	50	52	426767.8306				U					
OU4A	S4-26	60	62	426767.8306				U					
OU4A	S4-26	70	72	426767.8306				U					
OU4A	S4-26	80	82	426767.8306				U					
OU4A	S4-26	90	92	426767.8306				U					
OU4A	S4-26	120	122	426767.8306				U					
OU4A	S4-26	140	142	426767.8306				U					
OU4A	S4-26	160	162	426767.8306				U					
OU4A	S4-26	180	182	426767.8306				U					

RIVER_SECTION	LOCATION_ID	START_DEPTH	END_DEPTH	NORTHING	CESIUM_RESULT	CESIUM_QUALIFIER	TOTAL_AROCLOR_PCBS	AROCLOR_PCBS_QUALIFIER	TOC_RESULT	TOC_QUALIFIER	Aroclo_ 1260	Total_Congener_PCB	ISPEAK
OU4A	S4-26	196	198	426767.8306				U					
OU4A	S4-27	0	4	427203.5922			12.425						
OU4A	S4-27	30	32	427203.5922				U					
OU4A	S4-27	40	42	427203.5922				U					
OU4A	S4-27	50	52	427203.5922				U					
OU4A	S4-27	60	62	427203.5922				U					
OU4A	S4-27	70	72	427203.5922				U					
OU4A	S4-27	80	82	427203.5922				U					
OU4A	S4-27	90	92	427203.5922				U					
OU4A	S4-27	100	102	427203.5922				U					
OU4A	S4-27	110	112	427203.5922				U					
OU4A	S4-27	120	122	427203.5922				U					
OU4A	S4-27	130	132	427203.5922				U					
OU4A	S4-28	0	4	427295.7387			5.118333333		64666.66667				
OU4A	S4-28	20	22	427295.7387			33.677		73000		0.286557	29.8353	
OU4A	S4-28	30	32	427295.7387			44.876		67000		0.384102	37.5668	1
OU4A	S4-28	40	42	427295.7387			0.681	J	70000		0.256215	2.40702	
OU4A	S4-28	50	52	427295.7387				U	54000				
OU4A	S4-28	60	62	427295.7387				U	21000				
OU4A	S4-28	70	72	427295.7387				U	20000				
OU4A	S4-28	80	82	427295.7387			0.159	J	32000				
OU4A	S4-28	90	92	427295.7387				U	26000				
OU4A	S4-28	100	102	427295.7387				U	37000				
OU4A	S4-28	110	112	427295.7387				U	38000				
OU4A	S4-28	120	122	427295.7387				U	36000				
OU4A	S4-28	130	132	427295.7387				U	42000				
OU4A	S4-28	140	142	427295.7387				U	22000				
OU4A	S4-28	150	152	427295.7387				U	10000				
OU4A	S4-28	160	162	427295.7387				U	18000				
OU4A	S4-28	170	172	427295.7387				U	3000				
OU4A	S4-28	180	182	427295.7387				U	3500				
OU4A	S4-28	190	192	427295.7387				U	15000				
OU4A	S4-28	200	202	427295.7387				U	25000				
OU4A	S4-29	0	4	427482.4585			3.82						
OU4A	S4-29	0	4	427482.4585	0.526	+	1.3042	J	67000				
OU4A	S4-29	4	6	427482.4585			2.981	J	55000				
OU4A	S4-29	8	10	427482.4585			2.805	J	56000				
OU4A	S4-29	10	12	427482.4585			39.96		63000		0.113556	4.4943	
OU4A	S4-29	12	14	427482.4585			10.74		67000				
OU4A	S4-29	16	18	427482.4585			14.7		70000				
OU4A	S4-29	20	22	427482.4585	0.971	+	27.489		76000		0.185834	16.7019	
OU4A	S4-29	24	26	427482.4585			46.1		78000		0.312311	39.4902	1
OU4A	S4-29	28	30	427482.4585			36.756		67000				
OU4A	S4-29	30	32	427482.4585	1.55	+	38.01		81000				
OU4A	S4-29	32	34	427482.4585			34.79		80000				
OU4A	S4-29	34	36	427482.4585	1.15	+	27.719		87000				
OU4A	S4-29	36	38	427482.4585			37.54		73000		0.657045	23.2588	
OU4A	S4-29	38	40	427482.4585	0.517	+	6.11		77000				
OU4A	S4-29	40	42	427482.4585			3.224		49000				
OU4A	S4-29	50	52	427482.4585	0.109	U		U					
OU4A	S4-29	60	62	427482.4585				U					

RIVER_SECTION	LOCATION_ID	START_DEPTH	END_DEPTH	NORTHING	CESIUM_RESULT	CESIUM_QUALIFIER	TOTAL_AROCLOR_PCBS	AROCLOR_PCBS_QUALIFIER	TOC_RESULT	TOC_QUALIFIER	Aroclo_ 1260	Total_Congener_PCB	ISPEAK
OU4A	S4-29	70	72	427482.4585				U					
OU4A	S4-29	80	82	427482.4585			0.24	J					
OU4A	S4-29	90	92	427482.4585				U					
OU4A	S4-3	0	4	424158.3478			7.57						
OU4A	S4-3	0	4	424158.3478	0.432	+	7.76		76000				
OU4A	S4-3	10	12	424158.3478			9.6		77000				
OU4A	S4-3	20	22	424158.3478			23.955		88000				
OU4A	S4-3	24	26	424158.3478			36.4		78000		0.654471	43.5297	
OU4A	S4-3	28	30	424158.3478	1.17	+	68.73		92000		0.490411	59.5688	
OU4A	S4-3	30	32	424158.3478			92.4		130000		1.06977	82.4701	0.5
OU4A	S4-3	32	34	424158.3478			94.79		120000				
OU4A	S4-3	34	36	424158.3478	1.09	+	49.5		100000		0.568983	54.0493	0.5
OU4A	S4-3	36	38	424158.3478			49.09		110000				
OU4A	S4-3	40	42	424158.3478			24.464		110000		0.400204	15.8121	
OU4A	S4-3	50	52	424158.3478			0.853	J	62000				
OU4A	S4-3	60	62	424158.3478			1.06	J					
OU4A	S4-3	70	72	424158.3478				U					
OU4A	S4-3	80	82	424158.3478				U					
OU4A	S4-3	90	92	424158.3478				U					
OU4A	S4-3	110	112	424158.3478				U					
OU4A	S4-3	130	132	424158.3478				U					
OU4A	S4-3	150	152	424158.3478				U					
OU4A	S4-4	0	4	424246.4546			13.725						
OU4A	S4-4	30	32	424246.4546			0.941	J					
OU4A	S4-4	40	42	424246.4546				U					
OU4A	S4-4	50	52	424246.4546				U					
OU4A	S4-4	60	62	424246.4546				U					
OU4A	S4-4	70	72	424246.4546				U					
OU4A	S4-4	80	82	424246.4546				U					
OU4A	S4-4	90	92	424246.4546				U					
OU4A	S4-4	110	112	424246.4546				U					
OU4A	S4-4	130	132	424246.4546				U					
OU4A	S4-4	150	152	424246.4546				U					
OU4A	S4-5	0	4	424319.7682			7.44						
OU4A	S4-5	0	4	424319.7682	0.46	+	6.96		91500				
OU4A	S4-5	10	12	424319.7682			4.04		91000				
OU4A	S4-5	20	22	424319.7682			17.43		97000		0.243275	14.7477	
OU4A	S4-5	22	24	424319.7682	0.721	+	15.98		92000				
OU4A	S4-5	24	26	424319.7682			29.684		75000		0.190721	20.7282	0.5
OU4A	S4-5	26	28	424319.7682			15.24		55000				
OU4A	S4-5	28	30	424319.7682			29.799		70000				
OU4A	S4-5	30	32	424319.7682			31.86		97000		0.336866	25.6398	0.5
OU4A	S4-5	32	34	424319.7682	0.805	+	4.393		69000				
OU4A	S4-5	34	36	424319.7682			23.28		60000		0.245801	18.8305	
OU4A	S4-5	36	38	424319.7682			26.959		79000		0.33872	18.1982	
OU4A	S4-5	38	40	424319.7682	0.087	U	5.07		92000				
OU4A	S4-5	40	42	424319.7682			0.913	J	85000				
OU4A	S4-5	50	52	424319.7682	0.025	U		U					
OU4A	S4-5	60	62	424319.7682				U					
OU4A	S4-5	70	72	424319.7682				U					
OU4A	S4-5	80	82	424319.7682				U					

RIVER_SECTION	LOCATION_ID	START_DEPTH	END_DEPTH	NORTHING	CESIUM_RESULT	CESIUM_QUALIFIER	TOTAL_AROCLOR_PCBS	AROCLOR_PCBS_QUALIFIER	TOC_RESULT	TOC_QUALIFIER	Aroclo_ 1260	Total_Congener_PCB	ISPEAK
OU4A	S4-5	90	92	424319.7682				U					
OU4A	S4-6	0	4	424398.4994			12.05		80500				
OU4A	S4-6	10	12	424398.4994			5.67		57000				
OU4A	S4-6	20	22	424398.4994			117.76		93000		1.82002	112.068	1
OU4A	S4-6	26	28	424398.4994			53.955		89000		0.396321	49.3146	
OU4A	S4-6	30	32	424398.4994			47.736		95000				
OU4A	S4-6	34	36	424398.4994			49.998		97000		0.668957	38.5016	
OU4A	S4-6	40	42	424398.4994			44.058		90000				
OU4A	S4-6	44	46	424398.4994			38.455		79000		0.619112	30.2825	
OU4A	S4-6	50	52	424398.4994			18.7213		95000				
OU4A	S4-6	60	62	424398.4994			0.591	J	110000				
OU4A	S4-7	0	4	425038.6468			6.833333333		203333.3333	J			
OU4A	S4-7	30	32	425038.6468			44.749		86000	J	0.352022	29.0193	
OU4A	S4-7	40	42	425038.6468			45.648		87000	J			
OU4A	S4-7	50	52	425038.6468			42.021		100000	J	0.441791	32.3207	
OU4A	S4-7	60	62	425038.6468			48.468		87000	J	0.454643	38.0103	1
OU4A	S4-7	70	72	425038.6468			20.73		80000	J	0.784363	16.6787	
OU4A	S4-7	80	82	425038.6468			9.03		61000	J			
OU4A	S4-7	90	92	425038.6468			3.059	J	75000	J			
OU4A	S4-7	110	112	425038.6468			0.136	J					
OU4A	S4-7	130	132	425038.6468				U					
OU4A	S4-7	150	152	425038.6468				U					
OU4A	S4-8	0	4	425092.6956			5.22	J					
OU4A	S4-8	6	8	425092.6956	0.667	+	18.84		73000		0.23067	15.4239	
OU4A	S4-8	8	10	425092.6956			24.34		70000				
OU4A	S4-8	10	12	425092.6956	1.14	+	53.41		62000		0.403997	31.1515	1
OU4A	S4-8	12	14	425092.6956	1.39	+	35		83000		0.425287	36.4861	
OU4A	S4-8	16	18	425092.6956	2.65	+	45.832		89000		0.714638	36.52	
OU4A	S4-8	20	22	425092.6956	1.12	+	29.321		64000		0.584268	19.5912	
OU4A	S4-8	24	26	425092.6956			2.6452	J	93000				
OU4A	S4-8	30	32	425092.6956			0.1	J	54000				
OU4A	S4-8	40	42	425092.6956				U					
OU4A	S4-8	50	52	425092.6956			0.234	J					
OU4A	S4-8	60	62	425092.6956				U					
OU4A	S4-8	70	72	425092.6956				U					
OU4A	S4-8	80	82	425092.6956				U					
OU4A	S4-8	90	92	425092.6956				U					
OU4A	S4-8	100	102	425092.6956				U					
OU4A	S4-8	110	112	425092.6956				U					
OU4B	S4-30	0	4	428518.3601			1.965	J					
OU4B	S4-30	8	10	428518.3601			1.7002	J					
OU4B	S4-30	14	16	428518.3601			1.286	J					
OU4B	S4-30	20	22	428518.3601			4.16						
OU4B	S4-30	26	28	428518.3601			6.75						
OU4B	S4-30	30	32	428518.3601			5.298						
OU4B	S4-30	32	34	428518.3601			3.534	J					
OU4B	S4-30	36	38	428518.3601			0.477	J					
OU4B	S4-30	40	42	428518.3601				U					
OU4B	S4-30	50	52	428518.3601				U					
OU4B	S4-30	60	62	428518.3601				U					
OU4B	S4-30	70	72	428518.3601				U					

RIVER_SECTION	LOCATION_ID	START_DEPTH	END_DEPTH	NORTHING	CESIUM_RESULT	CESIUM_QUALIFIER	TOTAL_AROCLOR_PCBS	AROCLOR_PCBS_QUALIFIER	TOC_RESULT	TOC_QUALIFIER	Aroclo_ 1260	Total_Congener_PCB	ISPEAK
OU4B	S4-30	80	82	428518.3601				U					
OU4B	S4-30	90	92	428518.3601				U					
OU4B	S4-30	100	102	428518.3601				U					
OU4B	S4-30	110	112	428518.3601				U					
OU4B	S4-30	120	122	428518.3601				U					
OU4B	S4-30	130	132	428518.3601				U					
OU4B	S4-30	140	142	428518.3601				U					
OU4B	S4-30	150	152	428518.3601				U					
OU4B	S4-30	160	162	428518.3601				U					
OU4B	S4-31	0	4	428583.5023			2.769666667	J	65000				
OU4B	S4-31	20	22	428583.5023			1.91	J	47000				
OU4B	S4-31	40	42	428583.5023			3.35		61000				
OU4B	S4-31	50	52	428583.5023			4.71		57000				
OU4B	S4-31	60	62	428583.5023			6.026		79000				
OU4B	S4-31	70	72	428583.5023			8.25		81000				
OU4B	S4-31	80	82	428583.5023			14.252		54000				
OU4B	S4-31	90	92	428583.5023			19.862		70000				
OU4B	S4-31	100	102	428583.5023			45.39		76000		0.305502	38.4552	
OU4B	S4-31	110	112	428583.5023			51.21		60000				
OU4B	S4-31	120	122	428583.5023			159		69000		0.732313	135.217	1
OU4B	S4-31	130	132	428583.5023			209.1		88000		1.46536	161	1
OU4B	S4-31	140	142	428583.5023			92.2		72000		1.01262	89.8619	
OU4B	S4-31	150	152	428583.5023			49.16		99000				
OU4B	S4-31	160	162	428583.5023			59.45		71000				
OU4B	S4-31	170	172	428583.5023			42.14		75000				
OU4B	S4-31	180	182	428583.5023			42.18		81000				
OU4B	S4-31	190	192	428583.5023			60.43		76000		0.984728	50.5178	
OU4B	S4-31	200	202	428583.5023			55.94		79000				
OU4B	S4-31	210	212	428583.5023			54.86		63000				
OU4B	S4-32	0	4	428757.8827			19.86		83000				
OU4B	S4-32	0	4	428757.8827	0.66	+	19.22		97000				
OU4B	S4-32	30	32	428757.8827			5.678						
OU4B	S4-32	40	42	428757.8827			5.023						
OU4B	S4-32	50	52	428757.8827	0.535	+	8.549						
OU4B	S4-32	60	62	428757.8827			12.6		68000				
OU4B	S4-32	70	72	428757.8827			21.89						
OU4B	S4-32	80	82	428757.8827			30.4						
OU4B	S4-32	90	92	428757.8827			35.7						
OU4B	S4-32	100	102	428757.8827	0.841	+	47.60642						
OU4B	S4-32	110	112	428757.8827			33.936		67000				
OU4B	S4-32	120	122	428757.8827			40.2						
OU4B	S4-32	130	132	428757.8827			28.98		102000	J			
OU4B	S4-32	140	142	428757.8827	0.798	+	56.341		63000	J	0.498934	50.7952	
OU4B	S4-32	150	152	428757.8827			98.5		83000				
OU4B	S4-32	160	162	428757.8827			143.5		100000		3.18137	126.701	
OU4B	S4-32	170	172	428757.8827			149		88000				
OU4B	S4-32	180	182	428757.8827			199		110000				
OU4B	S4-32	190	192	428757.8827			239.6		100000		9.28951	225.989	
OU4B	S4-32	196	198	428757.8827			233.83		100000				
OU4B	S4-32	200	202	428757.8827			162.7		95000		1.12829	182.65	
OU4B	S4-32	204	206	428757.8827			491.6		94000		1.21763	191.497	1

RIVER_SECTION	LOCATION_ID	START_DEPTH	END_DEPTH	NORTHING	CESIUM_RESULT	CESIUM_QUALIFIER	TOTAL_AROCLOR_PCBS	AROCLOR_PCBS_QUALIFIER	TOC_RESULT	TOC_QUALIFIER	Aroclo_ 1260	Total_Congener_PCB	ISPEAK
OU4B	S4-32	206	208	428757.8827			208.706		110000		7.07385	257.804	
OU4B	S4-32	210	212	428757.8827	1.19	+	343		100000		12.7596	331.62	
OU4B	S4-32	216	218	428757.8827			174.35		87000				
OU4B	S4-32	224	226	428757.8827	1.02	+	86.538		79000				
OU4B	S4-32	230	232	428757.8827			79.511		100000		1.4699	115.24	
OU4B	S4-32	248	250	428757.8827	1.4	+	111.8		78000				
OU4B	S4-33	0	4	429029.25			2.65505	J					
OU4B	S4-33	10	12	429029.25				U					
OU4B	S4-33	20	22	429029.25				U					
OU4B	S4-33	30	32	429029.25				U					
OU4B	S4-33	40	42	429029.25				U					
OU4B	S4-33	50	52	429029.25				U					
OU4B	S4-33	60	62	429029.25				U					
OU4B	S4-33	70	72	429029.25				U					
OU4B	S4-33	80	82	429029.25			0.72	J					
OU4B	S4-33	90	92	429029.25				U					
OU4B	S4-33	110	112	429029.25				U					
OU4B	S4-33	130	132	429029.25				U					
OU4B	S4-33	150	152	429029.25				U					
OU4B	S4-34	0	4	429465.9799			0.0771	U					
OU4B	S4-34	10	12	429465.9799				U					
OU4B	S4-34	20	22	429465.9799				U					
OU4B	S4-34	30	32	429465.9799				U					
OU4B	S4-34	40	42	429465.9799				U					
OU4B	S4-34	50	52	429465.9799				U					
OU4B	S4-34	60	62	429465.9799				U					
OU4B	S4-34	70	72	429465.9799				U					
OU4B	S4-34	80	82	429465.9799				U					
OU4B	S4-34	90	92	429465.9799				U					
OU4B	S4-34	110	112	429465.9799				U					
OU4B	S4-34	130	132	429465.9799				U					
OU4B	S4-34	160	162	429465.9799				U					
OU4B	S4-34	180	182	429465.9799				U					
OU4B	S4-35	0	4	429192.7997			19.62						
OU4B	S4-35	0	4	429192.7997	0.37	+	19.09		55500				
OU4B	S4-35	6	8	429192.7997			55.229		81000		0.321814	44.4947	
OU4B	S4-35	10	12	429192.7997			67.806		65000				
OU4B	S4-35	14	16	429192.7997	0.909	+	69.2		54000		0.583101	57.9712	
OU4B	S4-35	16	18	429192.7997			44.152		46000				
OU4B	S4-35	18	20	429192.7997			50.202		53000				
OU4B	S4-35	20	22	429192.7997	1.39	+	96.5		81000		0.567376	77.5099	
OU4B	S4-35	22	24	429192.7997			118.72		90000		0.666791	99.0283	1
OU4B	S4-35	24	26	429192.7997			92.93		69000		0.824419	98.0966	1
OU4B	S4-35	26	28	429192.7997	0.927	+	70.444		80000				
OU4B	S4-35	28	30	429192.7997			52.324		76000				
OU4B	S4-35	30	32	429192.7997	1.28	+	67.785		82000				
OU4B	S4-35	32	34	429192.7997			67.397		86000				
OU4B	S4-35	36	38	429192.7997			80.744		98000		0.687272	73.0186	
OU4B	S4-35	40	42	429192.7997			55.145		81000				
OU4B	S4-35	50	52	429192.7997	2.7	+	51.97		93000		1.09831	35.4965	
OU4B	S4-35	60	62	429192.7997			5.5359		55000				

RIVER_SECTION	LOCATION_ID	START_DEPTH	END_DEPTH	NORTHING	CESIUM_RESULT	CESIUM_QUALIFIER	TOTAL_AROCLOR_PCBS	AROCLOR_PCBS_QUALIFIER	TOC_RESULT	TOC_QUALIFIER	Aroclo_ 1260	Total_Congener_PCB	ISPEAK
OU4B	S4-35	70	72	429192.7997			11.826						
OU4B	S4-35	80	82	429192.7997			0.444	J					
OU4B	S4-35	90	92	429192.7997				U					
OU4B	S4-35	110	112	429192.7997			1.09	J					
OU4B	S4-36	0	4	429551.5795			0.725	J					
OU4B	S4-36	10	12	429551.5795			0.847	J					
OU4B	S4-36	20	22	429551.5795			0.498	J					
OU4B	S4-36	30	32	429551.5795				U					
OU4B	S4-36	40	42	429551.5795				U					
OU4B	S4-36	50	52	429551.5795				U					
OU4B	S4-36	60	62	429551.5795				U					
OU4B	S4-36	70	72	429551.5795				U					
OU4B	S4-36	80	82	429551.5795				U					
OU4B	S4-36	90	92	429551.5795				U					
OU4B	S4-36	100	102	429551.5795				U					
OU4B	S4-37	0	4	432506.2965			1.15	J					
OU4B	S4-37	0	4	432506.2965	0.0655	U	0.612	J	10500				
OU4B	S4-37	6	8	432506.2965			39.2		42500		0.337582	25.8501	
OU4B	S4-37	8	10	432506.2965			78.13		55000		0.379087	41.2747	
OU4B	S4-37	10	12	432506.2965			90.6		54000		0.469842	62.8693	1
OU4B	S4-37	12	14	432506.2965	0.547	+	64.82		42000				
OU4B	S4-37	14	16	432506.2965			53.84		40000		0.580855	85.0598	
OU4B	S4-37	16	18	432506.2965			39.624		39000				
OU4B	S4-37	20	22	432506.2965	1.12	+	29.62		35000				
OU4B	S4-37	22	24	432506.2965			44.76		33000				
OU4B	S4-37	24	26	432506.2965			55.66		51000		0.407313	42.1805	
OU4B	S4-37	26	28	432506.2965	1.14	+	33.921		50000				
OU4B	S4-37	30	32	432506.2965			52.3814		52000				
OU4B	S4-37	32	34	432506.2965	0.929	+	42.564		61000		0.381944	34.803	
OU4B	S4-37	34	36	432506.2965	0.881	+	23.972		60000				
OU4B	S4-37	40	42	432506.2965			1.77		14000				
OU4B	S4-37	50	52	432506.2965			0.106	J					
OU4B	S4-37	60	62	432506.2965			0.196	J					
OU4B	S4-37	70	72	432506.2965			0.254	J					
OU4B	S4-37	80	82	432506.2965			0.107	J					
OU4B	S4-37	90	92	432506.2965				U					
OU4B	S4-38	0	4	432550.8585			3.44	U					
OU4B	S4-38	10	12	432550.8585			0.479	J					
OU4B	S4-38	20	22	432550.8585				U					
OU4B	S4-38	30	32	432550.8585				U					
OU4B	S4-38	40	42	432550.8585				U					
OU4B	S4-38	50	52	432550.8585				U					
OU4B	S4-38	60	62	432550.8585				U					
OU4B	S4-38	70	72	432550.8585				U					
OU4B	S4-38	80	82	432550.8585				U					
OU4B	S4-38	90	92	432550.8585				U					

APPENDIX D
RESUME OF JOHN P. CONNOLLY, PH.D., P.E., BCEE

JOHN P. CONNOLLY, PH.D., P.E., BCEE

Principal

PROFESSIONAL HISTORY

Anchor QEA, President and Senior Managing Engineer, February 1998 to present
USEPA Science Advisory Board, 2005 to present
HydroQual, Inc., Principal Engineer, 1993 to January 1998
HydroQual, Inc., Consultant, 1980 to 1993
Manhattan College, Professor, 1992 to 1994
Manhattan College, Associate Professor, 1986 to 1992
Manhattan College, Assistant Professor, 1980 to 1986
U.S. Environmental Protection Agency, Environmental Scientist, 1978 to 1980
Manhattan College, Research Engineer, 1975 to 1977

EDUCATION

The University of Texas at Austin, Ph.D., 1980
Manhattan College, M.E., Environmental Engineering, 1975
Manhattan College, B.E., Civil Engineering, 1973

Registration

Professional Engineer, State of Texas (License No. 92122)
Professional Engineer, State of New York (License No. 59428)

EXPERIENCE SUMMARY

Dr. Connolly is a member of the National Academy of Engineering and a nationally recognized expert on contaminated sediments and eutrophication. His work has been directed to surface water and groundwater contamination problems for the purposes of allocation among potential sources, evaluation of remedial options, remedy design or wasteload allocation (TMDLs). He is expert in water quality modeling and has been involved in the development of several models commonly applied to real world problems. He is also recognized for his ability to communicate complex technical results to the range of stakeholders typically involved in projects and is frequently called on to make presentations at regulatory hearings, community meetings and national and regional technical forums. Dr. Connolly has participated in negotiations with regulatory agencies to craft consent decrees governing contaminated sediment sites.

Dr. Connolly is frequently invited to participate in government and industry sponsored workshops. He is a member of the USEPA Science Advisory Board. He has worked throughout the U.S., in Latin America, and in Europe. He has served as an expert witness for industry and government agencies and has provided testimony before the U.S. Congress and the New York State Assembly. He is also a member of the Manhattan College Council of Engineering Affairs.

TESTIMONY

State of Oklahoma vs. Tyson Foods, Inc. et al.

For defendants Tyson Foods, Inc. et.al.; expert witness testimony at deposition from 4/8 to 4/9/09 and on 5/12/09 and at trial 12/18/09 to 12/22/09 and 1/22/2010 regarding the sources of bacteria and phosphorus to the Illinois River and Lake Tenkiller in Oklahoma, the water quality of these systems and the impact that poultry litter application in the watershed could have to water quality.

Maine Environmental Protection Board

Expert testimony given on 5/2/07 regarding the deficiencies of a phosphorus, TSS, and BOD TMDL developed for Gulf Island Pond on the Androscoggin River and the contributions of various sources to existing algal and dissolved oxygen problems.

Subcommittee on Water Resources and Environment of the U.S. House of Representatives Transportation and Infrastructure Committee Hearing on Strategies to Address Contaminated Sediments

Expert testimony given on 7/19/01 regarding the approaches used by USEPA to address contaminated sediments.

Maine Peoples' Alliance and Natural Resources Defense Council, Inc. vs. HoltraChem Manufacturing Company, LLC and Mallinckrodt, Inc.

For defendant Mallinckrodt; expert witness testimony at deposition on 7/3/01 and at trial on 3/12/02 regarding mercury bioavailability in the Penobscot River Estuary.

United States of America vs. Montrose Chemical Corporation of California, et al.

For plaintiff United States of America; expert witness testimony at deposition from 7/13 to 7/17/98 and 4/6/00 and at trial 10/19/00 regarding the transfer of DDT and PCBs from contaminated sediment in coastal waters off Los Angeles to fish, birds and sea lions.

Kalamazoo River Study Group vs. Rockwell International, et al.

For defendant Eaton Corporation; fact witness testimony at deposition on 7/22/97, expert testimony at deposition on 1/26/98 and trial testimony on 8/17 and 8/21/98, 1/19/01 and 2/5 and 2/6/01 regarding technical analyses conducted to evaluate the PCB contributions from Eaton's Battle Creek and Marshall facilities to the Kalamazoo River.

New York State Assembly Standing Committee on Environmental Conservation Public Hearing on PCB Contamination in the Hudson River

Expert testimony given on 3/19/97 on behalf of the General Electric Company regarding the sources of PCBs observed in Hudson River fish.

Alcoa and Northwest Alloys, Inc. vs. Accident & Casualty Insurance Company, et al.

For plaintiff Alcoa; expert witness testimony at deposition on 2/28 and 3/1/96 regarding the nature, extent and expansion of sediment contamination at Alcoa facilities in Massena, New York and Point Comfort, Texas.

REPRESENTATIVE PROJECT EXPERIENCE

Contaminated Sediments Assessment and Management

Relative Risk and Effectiveness of Remediation in the Lower Passaic River, NJ
Client: Group of Potentially Responsible Parties known as the Small Parties Group
Principal investigator for evaluating the relative contributions of the various contaminants of potential concern to perceived risk and the chemical-by-chemical benefits attainable by remediation. Represented the SPG in meetings with the larger Cooperating Parties Group (CPG) and led development of a strategy for interpreting site data, crafting a conceptual model and communicating the strategy and its results to the CPG and USEPA. The objective is to provide a basis to influence the direction of the project feasibility study and to provide an objective basis for cost allocation.

Peer Review of Contaminated Sediment Remediation Guidance for Hazardous Waste Sites,
Client: U.S. Environmental Protection Agency
One of three national experts tasked with reviewing the draft guidance document which has been developed to provide technical and policy guidance to project managers and management teams making remedy decisions for contaminated sediment sites.

Source Allocation for Mercury in the Penobscot River Estuary, Client: Mallinckrodt, Inc.
Principal investigator for evaluation of the relative contributions of sediment and water column mercury to mercury found in resident biota. This study involved data analysis and development of a conceptual modeling explaining the probable reasons of the apparent lack of impact of elevated sediment mercury concentrations on biota mercury levels. The work was used to provide litigation support through expert testimony. Subsequent to litigation, work has focused on development of a detailed investigation plan, interaction with a court-mandated Study Panel, technical support for the client's legal team and oversight of planned field work.

Source Allocation for Mercury in the Peconic River, Client: Brookhaven National Laboratory
Principal investigator for investigations to determine the sources of methyl mercury in the fish of the Peconic River. This study involved the design of sampling programs and interpretation of data to determine the relative contributions of background sources and various sediment deposits throughout the river to methyl mercury in the water and fish. This work was conducted to satisfy a diverse group of stakeholders with differing positions on appropriate remediation. It led to a revision of the contemplated remedial action and a convergence of opinion on the best approach for the river.

Investigation of Mercury in Lavaca Bay, Client: Alcoa
Principal investigator for the evaluation of mercury sources and prediction of the impacts of remedial actions and storm events on mercury levels in sediment and biota. The project involves data analysis and the development of linked hydrodynamic, sediment transport, mercury fate and

bioaccumulation models. A primary goal is the evaluation of the impact of hurricanes and other rare storms on buried mercury.

Remediation of the Hudson River PCBs Site, Client: General Electric Company

Principal investigator for various aspects of remedial design (RD), including the design and execution of an extensive pre-design sediment sampling program involving the collection of more than six thousand sediment cores, management of the RD database, determination of the dredging prisms, design and execution of the baseline and construction monitoring programs and support of the design of dredging and processing of dredged sediment. This project included the development of sophisticated data entry, data processing and data display systems that were used by the GE design team. Additional activities included direct participation in consent decree negotiations.

Analysis of the Fate of PCBs in the Hudson River, Client: General Electric Company

Principal investigator for extensive data analysis and modeling studies of the dynamics of PCBs in the Hudson River. This study involved field sampling, data analysis and the development of linked hydrodynamic, physical/chemical, sediment transport and food chain models for the purpose of predicting the effects of alternative remediation plans.

Analysis of the Fate of PCBs in the Grasse River, Client: Alcoa

Principal investigator for the determination of the impacts of contaminated sediments and point sources to PCB contamination in resident fish. Efforts include the design of field sampling programs, estimation of PCB fluxes between water and sediment, including the importance of areas of elevated concentrations and the transport and bioaccumulation in the food web. Goal is to provide a technical basis for examination of remedial options.

Assessment of Contribution of PCBs to the Kalamazoo River from Eaton Corporation Client: Eaton Corporation

Principal investigator for the analysis of data and development of models to evaluate whether either or both of two Eaton facilities contributed measurable quantities of PCBs to the Kalamazoo River. The project involved the compilation and analysis of historical data, design and execution of a sampling program and the development of models to predict the transport of sediment and PCBs through the Kalamazoo River.

Analysis of the Fate of PCBs in the Housatonic River, Client: General Electric Company

Technical advisor for extensive data analysis and modeling studies directed to determining the appropriate remedial solution for the contaminated sediments. This study involves data analysis and the development of linked hydrodynamic, sediment transport, PCB fate and PCB bioaccumulation models. An important aspect of this project is the evaluation of the role of river flooding in PCB fate and impact of flood plain soils.

Modeling of Heavy Metal and Organic Contaminant Fate in the Pawtuxet River to Support a RCRA Facility Investigation, Client: Ciba-Geigy Corporation

Principal investigator for determination of target chemicals by qualitative risk analysis, design of a sampling program and development of a model to evaluate temporal and spatial concentration reductions resulting from remedial action alternatives including excavation and groundwater treatment.

Analysis of DDE and PCB Transfer Pathways in the Southern California Bight Ecosystem, Client: National Oceanic and Atmospheric Administration

Principal investigator for the analysis of data and development of food chain models to study the relationship between sediment contamination and levels of DDE and PCBs in fish, mammals, and birds. The purpose of this work was to establish probable sources of contamination in support of a Natural Resource Damages Assessment.

Contaminated Groundwater Assessment and Management

Evaluation of Solvent Plume Migration and Fate at the MW Manufacturing Site, Valley Township of Pennsylvania, Client: Lucent Technologies

Principal investigator for the development and application of flow and transport models to be used to predict the movement and decay of a VOC plume composed of PCE, TCE, 1,2-DCE and vinyl chloride. The goal of the project is to estimate whether the plume has achieved a steady-state configuration in response to a non-aqueous phase source and to project discharge rates to a local stream.

Modeling of Groundwater Remediation Using Vertical Groundwater Circulation Technology, Client: SBP Technologies

Principal investigator for the development of a strategy to model the treatment efficiency of *in-situ* vertical groundwater circulation technology. Work included the evaluation of circulation, nutrient dynamics and PAH biodegradation and volatilization. The goal was to develop a modeling framework that could be used to design sampling strategies and evaluate treatment efficiency.

Total Maximum Daily Load (TMDL) Investigations

Evaluation of the Phosphorus, TSS and BOD TMDL for Gulf Island Pond on the Androscoggin River, Maine, Client: Verso Paper Company

Principal investigator for the critique of the TMDL developed by Maine DEP and the examination of the contributions of point and non-point sources to algal and dissolved oxygen problems in the Pond.

San Francisco Bay PCBs, Client: General Electric Company

Principal investigator for the review and critique of a draft TMDL document issued by the San Francisco Bay Regional Water Quality Control Board. This study involved the analysis of data and

modeling to provide the Board with the information necessary to correct deficiencies in the draft document with regard to natural recovery and the need for, and effectiveness of, available source control options and to develop an effective implementation strategy. It included the development of presentation materials and a face-to-face meeting with the authors of the document.

Coosa River PCBs, Client: General Electric Company

Principal investigator for the review and critique of a draft TMDL document issued by the State of Georgia. This study involved the analysis of data to provide the State with the information necessary to correct deficiencies in the draft document with regard to natural recovery and the need for, and effectiveness of, available source control options and to develop an effective implementation strategy. It included the development of presentation materials and a face-to-face meeting with the State and with EPA Region 4.

Water Quality/Eutrophication Assessment

Assessment of the Environmental Fate and Impact of ICE-B-GON on Lake Wingra, Wisconsin, Client: Chevron Research Company

Principal investigator for the laboratory determination of the degradation and oxygen utilization kinetics of the de-icing chemical, ICE-B-GON and projection of the effect of the use of this chemical on the dissolved oxygen of receiving waters using Lake Wingra as a case study.

Mathematical Modeling of Water Quality in Lake Erie, Client: U.S. Environmental Protection Agency, Grosse Ile, Michigan

Project Engineer in charge of data analysis development and calibration of an eutrophication model including multiple algal species and zooplankton, and projections of the effects of reduction in point and non-point nutrient loadings on pollution indicators; lake phytoplankton, nutrient, and dissolved oxygen levels.

Analysis of Heavy Metals, Ammonia and Cyanide in the Genesee River, Client: Eastman Kodak Corporation

Project Engineer in charge of data analysis, mathematical model development and assessment of the relative impact of the Kodak treatment plant effluent on water quality in the River.

Analysis of the Fate of Toxic Chemicals in Estuaries, Client: U.S. Environmental Protection Agency, Gulf Breeze, Florida

Project Manager in charge of development of a mathematical model describing the transport and degradation of toxic chemicals in estuarine environments.

Development of Version 4.0 of the Water Analysis Simulation Program (WASP), Client: U.S. Environmental Research Laboratory, Athens, Georgia

The purpose of this project was to modify the USEPA water quality model WASP (3.2) to provide a single modeling framework for use in all types of surface water problems including conventional and toxic pollutants under steady-state or time-variable conditions. Responsibilities included the

development of the kinetic routines for the toxic chemical component of the model from those used in EXAMS II, TOXIWASP, and WASTOX, integration of the WASTOX steady-state solution into WASP and providing technical assistance on all other components of model development.

Ecological Risk/Natural Resource Damage Assessments

Development of Water Quality Criteria for Wildlife, Client: U. S. Environmental Protection Agency

Principal investigator for the development of methodologies to determine water concentrations protective of aquatic feeding wildlife. Defined methods to relate laboratory toxicity estimates to wildlife species. Efforts included compilation and analysis of toxicity data, development of models to permit extrapolation of laboratory toxicity data to field animals and development of models of the relationship between water column contaminant concentrations and effects in wildlife. Initial work focused on dieldrin and DDT.

Modeling PCBs in the Aquatic Biota of Green Bay, Client: U.S. Environmental Protection Agency

Principal investigator for the development and application of a model of PCBs in the food web of Green Bay. This work is part of the Green Bay Mass Balance Study for the U.S. Environmental Protection Agency. The purpose of these studies was to evaluate the impacts of potential remediation alternatives.

Analysis of PCBs and Metals Contamination in the Biota of New Bedford Harbor, Massachusetts, Client: U.S. Environmental Protection Agency, Region I, Battelle Ocean Sciences

Project manager in charge of developing a mathematical model of the contamination of the lobster and winter flounder and their food chains in New Bedford Harbor and Buzzards Bay. Responsible for linking this model with a hydrodynamic-contaminant fate model developed by Battelle Northwest to project the response of the biota to various remedial action alternatives. This work was part of an EPA Superfund project in New Bedford Harbor.

Analysis of PCBs in the Hudson River Striped Bass and its Food Chain, Client: Hudson River Foundation, New York, NY

Project manager in charge of the development of a mathematical model describing the accumulation of PCBs in the striped bass food chain.

Analysis of Kepone Accumulation in the Striped Bass Food Web of the James River Estuary, Client: U.S. Environmental Protection Agency, Gulf Breeze, Florida

Project manager in charge of the development and application of a mathematical model describing the accumulation of the pesticide Kepone in the striped bass food chain. Projected the response of the food chain to declining exposure concentrations.

Pathogen Fate and Transport

Development of a Framework for Predicting the Fate of Genetically Engineered Microorganisms in Surface Water Systems, Client: U.S. Environmental Protection Agency, Environmental Research Laboratory, Gulf Breeze, Florida

Principal investigator for the development of a model of the population dynamics of bacteria, phytoplankton and zooplankton in surface waters and application of this model to predicting the risk associated with the introduction of genetically engineered bacteria to these environments. Population dynamics models were developed for the Delaware River and Mirror Lake.

Modeling Fate and Transport of Pathogenic Organisms in Mamala Bay, Hawaii, Client: Mamala Bay Study Commission

Principal investigator for review of historical data, design of a sampling program and development and calibration of a mathematical model of pathogen fate in Mamala Bay. Goal is to determine pathogen sources and level of control necessary to meet water quality goals.

Evaluation of Cryptosporidium Sources and Fate in Milwaukee, Wisconsin, Client: Sara Lee Corporation

Principal investigator for the evaluation of the likely contribution of various potential sources to the Cryptosporidium responsible for a disease outbreak in the city of Milwaukee.

Hydraulic Engineering

Hydraulic Analysis of the Fairfield, New Jersey Sewer System, Client: Lee Purcell Associates, Inc.

Project engineer in charge of determining the capacity and flow characteristics of an in-place sewer system. Developed a gradually varied flow analysis for this purpose.

HONORS

Elected to the National Academy of Engineering, 2010
Diplomate Environmental Engineer by Eminence, American Academy of Environmental Engineers, 2002
Manhattan College Environmental Engineering Alumni Club Service Award, 1994

PROFESSIONAL ACTIVITIES

Affiliations

National Academy of Engineering
American Academy of Environmental Engineers
Sigma Xi - The National Scientific Research Society
Society of Environmental Toxicology and Chemistry
American Society of Limnology and Oceanography
Water Environment Federation

Committees and Advisory Boards

USEPA Science Advisory Board, Environmental Engineering Committee
1997, USEPA Technical Qualifications Board to review promotion application
1991-96, New York Water Environment Association Outstanding Paper Award Committee
DuPont Technical Advisory Board for Evaluation of HMPA Releases at their Spurance Plant in Richmond, VA
1990, USEPA Exploratory Research Review Panel

Invited Participation in Technical Workshops

Addressing Uncertainty and Managing Risk at Contaminated Sediment Sites. St. Louis, MO October 26-28, 2004 – Steering Committee Member.

SERDP/ESTCP Contaminated Sediments Workshop. Arlington, VA August 10-11, 2004.

Stability of Chemicals in Sediments. San Diego, CA April 8-10, 2003 – Steering Committee Member.

Sediment Stability Workshop. New Orleans, LA, January 22-24, 2002 – Steering Committee Member.

U.S. EPA Forum on Contaminated Sediments. Alexandria, VA, May 30-June 1, 2001.

National Research Council Workshop on Bioavailability. Washington, D.C., November 12, 1998.

SETAC Pellston Workshop: Re-evaluation of the State of the Science for Water Quality Criteria Development. Fairmont Hot Springs, MT, June 25-30, 1998.

National Academy of Sciences National Symposium on Contaminated Sediments. Washington, D.C., May 27-29, 1998.

SETAC Pellston Workshop: Reassessment of Metals Criteria for Aquatic Life Protection. Pensacola, FL, February 10-14, 1996.

California EPA Workshop on Critical Issues in Assessing Ecological Risk. Asilomar, CA, January 23-25, 1995.

USEPA Workshop on Taura Syndrome. Gulf Breeze, FL, August 2-3, 1994.

USEPA Workshop on Modeling Uncertainty. Buffalo, NY, February 3-5, 1991.

USEPA Workshop on Sediment Quality Criteria. Grosse Ile, MI, March 29-30, 1990.

Industry Sponsored Workshop on the Environmental Impacts of the Deicer Calcium-Magnesium-Acetate. Albany, NY, February 27, 1990.

USEPA Workshop on Biotechnology Risk Assessment. Breckenridge, CO, January 11-15, 1988.

SETAC Workshop on Risk Assessment. Breckenridge, CO, August 17-21, 1987.

Presentations

Interpretation of Spatial Patterns of Contaminants in the Lower Passaic River. SETAC 20th Annual Meeting, New Orleans, LA, November 22, 2009.

Long-Term Monitoring of PCBs in the Grasse River. Fifth International Conference on Remediation of Contaminated Sediments, Fort Lauderdale, FL, February 4, 2009.

Overview of the 2005 Grasse River Remedial Options Pilot Study. Fourth International Conference on Remediation of Contaminated Sediments, Savannah, GA, January 22-25, 2007.

Challenges to Monitoring and Assessing Natural Recovery. Third International Conference on Remediation of Contaminated Sediments, New Orleans, LA, January 27, 2005.

Monitoring to Support the Dredging Remedy on the Upper Hudson River. Third International Conference on Remediation of Contaminated Sediments, New Orleans, LA, January 26, 2005.

Adaptive Management as a Measured Response to the Uncertainty Problem. Addressing Uncertainty and Managing Risk at Contaminated Sediment Sites, St. Louis, MO, October 27, 2004

Optimal Use of Conceptual and Mathematical Models at Contaminated Sediment Sites. Addressing Uncertainty and Managing Risk at Contaminated Sediment Sites, St. Louis, MO, October 27, 2004

Sampling of Sediment and Water in the Upper Hudson River to Support the USEPA Dredging Remedy. Hudson River Environmental Society Conference, RPI, Troy, NY, October 5, 2004

Nature and Causes of Non-Particle Related Contaminant Releases in Large River Systems. Workshop on Environmental Stability of Chemicals in Sediments, San Diego, CA, April 10, 2003

Management of Contaminated Sediments. NSF US/Italy Workshop on Sediments, Arlington, VA, December 10, 2002

Use of Sound Science to Develop a Defensible Site Model. U.S. EPA Forum on Managing Contaminated Sediments, Alexandria, VA, May 31, 2001.

A Quantitative Framework for Evaluating Contaminated Sediment Sites. SETAC 20th Annual Meeting, Philadelphia, PA, November 14-18, 1999.

Prediction of Natural Recovery and the Impacts of Active Remediation in the Upper Hudson River. SETAC 20th Annual Meeting, Philadelphia, PA, November 14-18, 1999.

Evaluation of Remedial Alternatives for Contaminated Sediments: A Coherent Decision-Making Approach. National Research Council, National Symposium on Contaminated Sediments, Washington, D.C., May 28, 1998.

Applications of Models to the Risk Assessment Problem. Chesapeake Biological Laboratory, Solomans, MD, November 1, 1996.

Use of Food Web Models to Evaluate Bioaccumulation Data. National Sediment Bioaccumulation Conference, Bethesda, MD, September 11, 1996.

Assessment and Remediation of Contaminated Sediments at MGP Sites. Electric Power Research Institute, Monterey, CA, August 28, 1996.

Modeling the Environmental Fate and Transport of Metals. 26th Pellston Workshop: Reassessment of Metals Criteria for Aquatic Life Protection, Pensacola, FL, February 11, 1996.

Toxicologically Based Ecological Risk Assessment. California EPA Workshop on Critical Issues in Assessing Ecological Risk, Asilomar, CA, January 24, 1995.

Data Requirements for the Development and Use of Water Quality Models. USEPA Conference on Quality Assurance in Environmental Decision Making, IBM T.J. Watson Research Center, Yorktown Heights, NY, November 2, 1994.

Mathematical Modeling of the Bioaccumulation of Hydrophobic Organics. National Biological Survey, Columbia, MO, August 25, 1994.

A Model-Based Evaluation of PCB Bioaccumulation in Green Bay Walleye and Brown Trout. International Association for Great Lakes Research 36th Conference on Great Lakes Research, De Pere, WI, June 7, 1993.

Bioaccumulation Modeling of Micropollutants in the Field. International Workshop on Mechanisms of Uptake and Accumulation of Micropollutants, Veldhoven, The Netherlands, May 25, 1993.

Keynote Presentation. NIEHS Sponsored Workshop on the Bioaccumulation of Hydrophobic Organic Chemicals in Aquatic Organisms, June 29, 1992.

Modeling the Role of Bacteria in Carbon Cycling. Gordon Research Conference, New Hampton, New Hampshire, June 17, 1992.

Calcium Magnesium Acetate Biodegradation and its Impact on Surface Waters. Symposium on the Environmental Impact of Highway Deicing, University of California, Davis, October 13, 1989.

Food Chain Modeling in the Green Bay Mass Balance Study. International Association for Great Lakes Research 32nd Conference on Great Lakes Research, Madison, WI, June 2, 1989.

Modeling the Fate of Bacteria in Aquatic Systems. American Society for Microbiology Annual Conference, New Orleans, LA, May 18, 1989.

Application of a Food Chain Model to Evaluate Remedial Alternatives for PCB-Contaminated Sediments in New Bedford Harbor, MA, Superfund '88, Washington, D.C., November 29, 1988.

Modeling the Accumulation of Organic Chemicals in Aquatic Animals. Joint USA/USSR Symposium: Fate of Pesticides and Chemicals in the Environment, The University of Iowa, Iowa City, IA, November 15, 1987.

Modeling Kepone in the Striped Bass Food Chain of the James River. Virginia State Water Control Board, Richmond, VA, August 15, 1983.

Predicting the Effects of Toxic Chemicals in Natural Water Systems. U.S. Environmental Protection Agency, Environmental Research Lab, Athens, GA, November 3, 1982.

Modeling Toxic Substances in Aquatic Food Chains. Clarkson College Environmental Engineering Graduate Program, Potsdam, NY, October 29, 1982.

Predicting the Effects of Toxic Chemicals in Natural Water Systems. U.S. Environmental Protection Agency, Environmental Research Lab, Gulf Breeze, FL, September 13, 1982.

Modeling of Fate of Toxic Chemicals in Aquatic Systems. U.S. Environmental Protection Agency, Office of Toxic Substances, Washington, D.C., March 16, 1982.

Publications

Comment on "The Long-Term Fate of Polychlorinated Biphenyls in San Francisco Bay, (USA)". Connolly, J.P., C.K. Ziegler, E.M. Lamoureux, J.A. Benaman and D. Opydke, *Envion. Toxicol. Chem.* 24:2397-2398, 2005.

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A model of p,p'-DDE and total PCB bioaccumulation in birds from the Southern California Bight. Glaser D, J.P. Connolly, *Continental Shelf Research* 22:1079-1100, 2002.

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Modeling the Accumulation of Organic Chemicals in Aquatic Food Chains. Connolly, J.P. and R.V. Thomann, In: *Fate of Pesticides and Chemicals in the Environment*, Schnoor, J.L. ed., John Wiley & Sons, Inc., 1991.

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Movement of Kepone (Chloradecone) Across an Undisturbed Sediment-Water Interface in Laboratory Systems. Pritchard, P.H., C.A. Monti, E.J. O'Neill, J.P. Connolly and D.G. Ahearn, *Environ. Tox. Chem.*, 5:647-658, 1986.

Bioaccumulation of Kepone by Spot (*Leiostomus xanthurus*): Importance of Dietary Accumulation and Ingestion Rate. Fisher, D.J., J.R. Clark, M.H. Roberts, Jr., J.P. Connolly and L.H. Mueller, *Aquatic Tox.* 9:161-178, 1986.

A Model of Kepone in the Striped Bass Food Chain of the James River Estuary. Connolly, J.P. and R. Tonelli, *Estuarine, Coastal & Shelf Science* 20:349-366, 1985.

Predicting Single Species Toxicity in Natural Water Systems. Connolly, J.P., *Environ. Tox. Chem.* 4:573-582, 1985.

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WASTOX, A Framework for Modeling Toxic Chemicals in Aquatic Systems. Connolly, J.P. and R.P. Winfield, U.S. Environmental Protection Agency, Gulf Breeze, FL, EPA 600/3-84-077, 1984.

Adsorption of Hydrophobic Pollutants in Estuaries. Connolly, J.P., Armstrong, N.E. and R.W. Miksad, ASCE *J. Envir. Eng. Div.* 109(1):17-35, 1983.

Calculated Contribution of Surface Microlayer PCB to Contamination of the Lake Michigan Lake Trout. Connolly, J.P. and R.V. Thomann, *J. Great Lakes Research* 8(2):367-375, 1982.

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The Effect of Concentration of Adsorbing Solids on the Partition Coefficient. O'Connor, D.J. and J.P. Connolly, *Water Research* 14(10):1517-1523, 1980.

U.S. Department of Justice

Environment and Natural Resources Division

JMG:MMK
90-11-2-1045Z

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May 12, 2000

J. Andrew Schlickman, Esq.
Sidley & Austin
Bank One Plaza
10 South Dearborn Street
Chicago, IL 60603

Re: Fox River/Green Bay: NCR/Appleton Paper

Dear Andy:

I am enclosing for your and your client's review, a report on the United States' "Preliminary Estimates of PCB Discharges to the Fox River." The government has prepared the report in consultation with the State of Wisconsin, the Oneida Tribe of Indians of Wisconsin and the Menominee Indian Tribe of Wisconsin in connection with the Fox River/Green Bay matter. This report is also being provided to each of the companies listed on enclosed Table 3 although company-specific information is being provided only to the company that submitted it.

You will note that at page 4 of the enclosed, we are requesting your client to provide supplemental responses to four information requests. A formal request for this supplemental information, pursuant to the authority of Section 104 of the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §9604, will be forthcoming shortly from the U.S. Fish and Wildlife Service. Additionally, we are requesting all recipients to review and comment on the site-specific data used for their facilities as well as the key factors and assumptions we used to develop the preliminary estimates. We would appreciate receiving any such comments within 30 days. If this poses a difficulty for your client, please let me know.

I would like to underscore that the enclosed estimates are preliminary and may change based on comments we receive or other additional information.

If you have any questions, please do not hesitate to call.

Sincerely,

Maureen M. Katz
Senior Attorney

Enclosure

cc: Roger M. Grimes
Joan Goldfarb
Tony Giedt
Peggy Schneider
Rollie Wilson
Shari Eggleson

Preliminary Estimates of PCB Discharges to the Fox River

1954 to 1985

1. Introduction

This brief report presents a summary of preliminary estimates of PCB discharges to the Fox River for the period 1954 to 1985 associated with manufacture of NCR carbonless copy paper containing PCB emulsions and the distribution and recycle of NCR paper broke, NCR paper converter trim and secondary fiber containing PCBs. The methodology used to develop the preliminary estimates is briefly described. Principal sources of information and data used to develop the estimates were: (1) responses by paper companies and selected Fox River municipal authorities to Section 104(e) requests from the Department of Interior; (2) the Wisconsin Department of Natural Resources; and, (3) published technical literature.

The purposes of this report are to set out for review and comment by each of the affected paper companies the site-specific data used for their mills and the key factors and assumption used to develop the preliminary estimates. The key factors and assumptions are categorized as follows:

- those associated with releases of PCBs from manufacture of NCR paper;
- those associated with distribution of NCR paper broke, NCR paper converter trim, and secondary fiber containing PCBs to Fox Valley paper mills;
- those associated with partitioning of PCBs to product and process waters during secondary fiber processing operations; and,
- those associated with partitioning of PCBs to wastewater treatment sludges and final effluents in industrial and municipal wastewater treatment operations.

Because several paper companies have claimed some of the information and data used to develop the preliminary estimates as confidential business information, mill-specific information are provided only to the paper companies that have submitted that data.

For purposes of presenting preliminary estimates, four cases were developed using alternative assumptions for each of the key factors noted above. For Case 1, the assumptions for major factors were selected to produce relatively low aggregate PCB discharges to the Fox River from all sources; for Case 3, relatively high aggregate PCB discharges. Case 2 represents the mid-range or average of the assumptions used for Cases 1 and 3. Because the results for Cases 1 and 3 show relatively little difference in PCB allocations in percentage terms, a fourth case was developed to show collectively the sensitivity of the PCB allocation methodology to key factors associated with the NCR paper coating process and removal of PCBs from the process wastewater stream at Appleton Papers.

Section 2 of this report sets out the classification of Fox River paper mills. Section 3 presents a review of the methodology used for the preliminary estimates, the assumptions for key factors and identifies areas where comments are requested. The preliminary PCB loading estimates resulting from the cases described above are presented in Section 4. The estimates presented are preliminary and subject to change based on comments and additional information and data that may be obtained. No attempt is made in this report to account for the distribution of PCBs from any source to Fox River sediments.

Enclosed for each paper company is a summary of site-specific information and data used in preparing the preliminary estimates. Each company is encouraged to review the information and data presented and provide corrections and comments. Also enclosed as separate attachments for each mill are mill- specific requests for supplemental information, where such requests are being made.

2. *Classification of Fox River Paper Mills*

Table 1 sets out the classification of Fox River paper mills used for this analysis. Briefly, the mills were classified as follows: (1) mills with NCR paper coating operations during the period 1954 to 1971; (2) secondary fiber mills with deinking operations; (3) secondary fiber mills with no deinking operations; and (4) other mills. Mead Paper conducted NCR paper coating operations during the period 1954 to 1971 at its mill located in Chillicothe, Ohio. That mill is included in this review only for purposes of assessing possible amounts of NCR paper broke that may have been distributed to mills located in the Fox Valley for recycle as a source of fiber.

3. *Methodology , Key Factors and Assumptions*

Figure 1 is a flow chart of likely PCB pathways to the Fox River associated with manufacture of NCR carbonless copy paper and distribution of NCR paper broke, NCR paper converter trim and other sources of secondary fiber to Fox Valley paper mills. In short, the methodology followed to produce the preliminary estimates was to conduct PCB mass balances beginning with the distribution of PCB emulsion to NCR paper coating facilities, followed by NCR paper converting operations; Fox Valley paper mills; and, those municipal sewerage systems and publicly owned treatment works (POTWs or municipal wastewater treatment plants) that received paper mill process wastewaters for treatment. The mass balances included consideration of PCBs contained in NCR carbonless paper product, broke and converter trim; losses from NCR paper coating operations; removal in on-site recovery and treatment systems; sewerage system losses and removals at receiving POTWs; partitioning to product, wastewater and sludge at secondary fiber mills; and, losses from the Arrowhead landfill (specific to P.H. Glatfelter). Volatilization of PCBs and releases to the air were not considered. Based on responses from paper companies to Section 104(e) requests, we assumed that mills without secondary fiber deinking facilities did not process routinely NCR paper broke or NCR paper converter trim as part of their fiber supply.

To the extent possible, responses to Section 104(e) requests were used as the primary sources of information and data. Other principal sources included reports prepared by the WDNR (Technical Memorandum 2d (February 1999); and, a supplemental memorandum by Jim Witthuhn regarding the City of Appleton sewerage system (February 7,1999)); and, published technical literature.

The key factors and assumptions made to date are set out in Table 2 with brief notes. Comments are requested regarding the overall approach used, the ranges values used for key factors and whether alternative approaches and assumptions should be considered.

4. Preliminary Estimates

Tables 3 and 4 present the preliminary PCB loading estimates for each case evaluated and the percentages of the total estimates for each mill, respectively. The total PCB loadings for each case are presented below:

		Estimated PCB Discharges to Fox River 1954 to 1985	
Case 1	Low Range	467,000	pounds
Case 2	Mid Range (Cases 1 & 3)	776,000	pounds
Case 3	High Range	1,222,000	pounds
Case 4	Maximum loss - NCR coating mills	1,619,000	pounds

Although the estimates of the total amount of PCBs discharged increase from Case 1 to Case 3, the nature and range of values used for key factors are such that there is relatively little change in percentage allocations to individual mills across these cases. The results for Case 4 show, in part, the sensitivity of the allocation results to key factors and assumptions associated with maximum estimated PCB losses from the NCR paper coating mills.

The results of the PCB allocation are subject to change based on consideration of alternate assumptions for key factors and different mixes of assumptions for key factors.

Gary A. Amendola, P.E.
Matthew A. Oxsalida
Amendola Engineering, Inc.
Rocky River, Ohio

May 10, 2000

Supplemental Requests for Information

NCR/Appleton
Appleton Papers, Appleton, WI
Appleton Combined Locks Mill. Combined Locks, WI

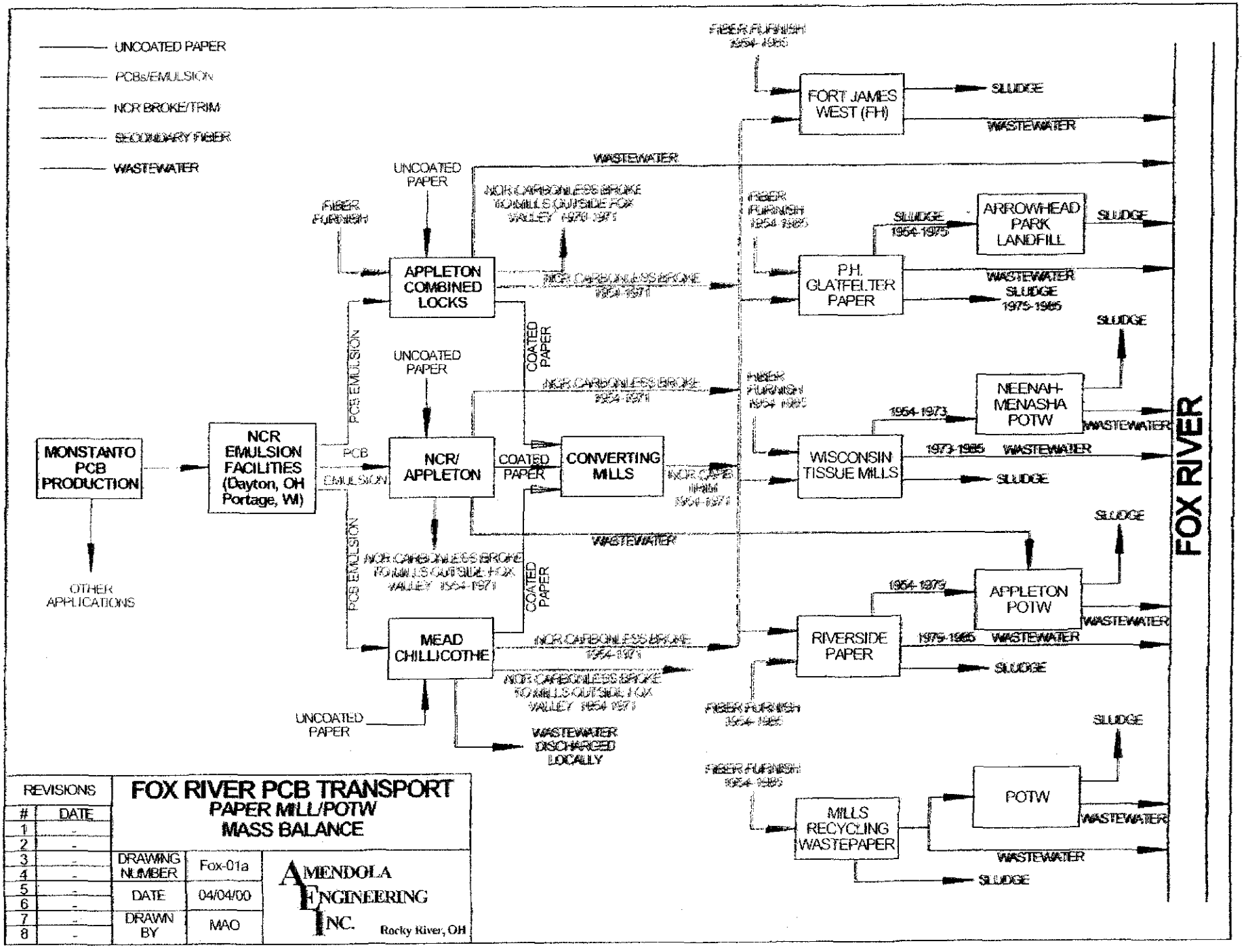
1. For any estimates of PCB losses associated with NCR paper coating operations that may be provided in response to requests for comments, provide the basis for engineering considerations and assumptions associated with each factor, including, but not limited to:

   losses associated with unloading, transfer and handing of PCB emulsions
   losses associated with the paper coating process
   recovery systems at the paper coating machines
   losses associated with grade changes
   frequency and nature of maintenance and clean-up operations

2. For removal of PCBs from the process wastewaters in "honey tanks", provide the basis for engineering considerations and assumptions to derive any per cent removal that may be provided in response to requests for comments.

3. For each paper coating machine used at the Appleton Papers and the Combined Locks mill during the period 1954 to 1971 for coating of NCR paper with PCB emulsions, provide the typical diameter of the roll core, the typical diameter of the finished roll, and the typical amount of roll end trim coated with PCBs lost as broke.

4. For the period 1954 to 1971, provide the name and location of NCR paper converting facilities which received NCR paper coated with PCB emulsions from Appleton Papers and from the Appleton Combined Locks mill.



REVISIONS	
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1	-
2	-
3	-
4	-
5	-
6	-
7	-
8	-

FOX RIVER PCB TRANSPORT
PAPER MILL/POTW MASS BALANCE

DRAWING NUMBER	Fox-01a
DATE	04/04/00
DRAWN BY	MAO

AMENDOLA ENGINEERING INC. Rocky River, OH

Table 1

Classification of Fox River Paper Mills

Facility	Former Name	Location
Mills with NCR Paper Coating Operations (Note 1)		
Appleton Papers - Appleton	NCR - Appleton	Appleton
Appleton Papers - Combined Locks		Combined Locks
Secondary Fiber Mills with Deinking Operations		
P.H. Glatfelter Paper	Bergstrom Paper	Neenah
Wisconsin Tissue Mills		Menasha
Riverside Paper	Kerwin Paper	Appleton
Appleton Papers - Combined Locks		Combined Locks
Fort James Green Bay West	Fort Howard Paper	Green Bay
Secondary Fiber Mills with no Deinking Operations		
Kimberly Clark (Neenah & Badger Globe Mills)		Neenah
American Tissue Mills	Kimberly Clark - Lakeview	Neenah
U.S. Paper - Menasha	Menasha Corporation	Menasha
Consolidated Papers		Appleton
U.S. Paper - DePere		DePere
Green Bay Packaging		Green Bay
Proctor & Gamble Paper		Green Bay
Fort James Green Bay East	James River	Green Bay

Note 1: Mead Paper conducted NCR paper coating operations using PCB emulsions during the period 1954 to 1971 at its paper mill located at Chillicothe, Ohio.

Table 2

Key Assumptions for Preliminary Estimates

Key Assumption	Possible Range	Notes	Supplemental Information Request
NCR Paper Manufacturing			
PCB emulsion loss during coating operations	2% to 5%	Limited information in record; key factor affecting PCB release estimates. Case 3 based on 3%; Case 4 based on 5%.	Documentation for loss estimates
Honey tank PCB removal at Appleton Papers	0% to 50%	No documentation for estimates; key factor affecting PCB release estimates. Case 3 based on 10%; Case 4 based on 0%.	Documentation for loss estimates
Broke generation (as per cent of total NCR production)	10.6%	Based on information in record	Roll sizes (width and typical diameters for paper coating machines at Appleton Papers and Combined Locks mills to estimate roll end losses of fully coated broke
Area of broke coated with PCB emulsion	62.5%	Does not account for roll end losses of fully coated paper	See above
NCR Paper Broke, Converter Trim and Secondary Fiber Containing PCBs			
Broke recycled from NCR/Appleton & Appleton - Locks to Fox Valley	80% to 100%	Assumption based on location and deink capacity in Fox Valley; WDNR Tech Memo 2d (02/23/99)	
Broke recycled from Mead-Chillicothe to Fox Valley	10% to 25%	Mead Paper reports the vast majority of broke was sold locally or to mills in locations other than the Fox River area.	

Table 2

Key Assumptions for Preliminary Estimates

Key Assumption	Possible Range	Notes	Supplemental Information Request
Converter trim generated (as a % of total NCR paper converting)	10% to 15%		Supplemental information and data
Converter trim recycled to the Fox Valley	15% to 25%	Key factor affecting PCB loadings	Location of NCR paper converting mills
Distribution of NCR paper broke and converter trim within the Fox Valley	Proportioned to deinking capacity (except Appleton Locks, which was assigned no broke or converter trim)	Information in record does not support alternative assumptions; key factor affecting relative PCB loadings among secondary fiber deink mills	Information about quality of NCR broke and converter trim as a secondary fiber source for products made at different mills. Is it more likely that mills producing higher grade paper products would use NCR paper broke and converter trim as a fiber source than mills producing lower grade paper products?
PCB concentrations in various grades of secondary fiber over time	see attached graphs	Based on several data sources; some claimed as confidential business information	Other available data; remove claims of confidential business information
PCB concentrations in wood pulps	see attached graph	Based on data source claimed as confidential business information. PCB content assumed to be unrelated to NCR Paper manufacturing	Other available data; remove claims of confidential business information
PCB Partitioning to Product/Wastewater			
PCB partitioning to product (deink mills)	25% to 50%	Limited sources of information; key factor affecting relative PCB loadings among secondary fiber mills	Supplemental information and data

Table 2

Key Assumptions for Preliminary Estimates

Key Assumption	Possible Range	Notes	Supplemental Information Request
PCB partitioning to product (other mills)	50% to 75%	Limited sources of information; key factor affecting relative PCB loadings among secondary fiber mills	Supplemental information and data
PCB Partitioning to Wastewater Sludges/Final Effluents			
POTW TSS/PCB removals Bypassed flows Primary Treatment Primary & Secondary Treatment Primary, Secondary & Advanced Trat.	 0% 70% 92% 95%	Industrial Environmental Control, Pulp & Paper Industry; Springer, John Wiley & Sons, 1986	
Appleton POTW system bypasses (as a % of total flow sent through system)	16% - 33%	variable on annual basis; WDNR Tech Memo 2d (02/23/99), Work activities related to Tech Memo 2d (Witthuhn report, 02/07/99)	
Neenah-Menasha POTW system bypasses (as a % of total flow sent through system)	1% to 47%	variable on annual basis; WDNR Tech Memo 2d (02/23/99)	
Paper Mill TSS/PCB removals Fiber Recovery Primary Treatment Primary & Secondary Treatment Primary, Secondary & Advanced Trat.	 10% 70% 92% 95%	Industrial Environmental Control, Pulp & Paper Industry; Springer, John Wiley & Sons, 1986	
Arrowhead Landfill PCB Loss (P.H. Glatfelter) (as a % of total placed in landfill)	5% to 10%	WDNR Tech Memo 2d (02/23/99)	

Table 3

Preliminary Estimates of PCB Releases to the Fox River

PCB Releases, pounds (1954 to 1985)

	Case 1	Case 2	Case 3	Case 4
NCR Paper Coating Mills				
NCR/Appleton	167,240	292,669	451,547	836, 198
Appleton - Locks	16,585	20,740	24,896	41,445
Secondary Fiber Deink Mills				
P.H. Glatfelter	74,525	127,862	215,405	214,258
Wisconsin Tissue	17,350	27,961	44,240	44,000
Riverside	5,727	8,014	10,751	10,751
Fort James GB West	185,192	297,958	474,392	471,859
Secondary Fiber Non-Deink and Other Mills				
Kimberly Clark	17	26	34	34
U.S. Paper-Menasha	139	208	278	278
American Tissue	104	156	207	207
U.S. Paper - DePere	33	49	65	65
GB Packaging	23	35	47	47
Proctor & Gamble	61	91	121	121
Fort James GB East	56	82	110	110
Consolidated Papers	17	26	35	35
Total - All Mills	467,068	775,878	1,222,128	1,619,407

Table 4

Preliminary Estimates of PCB Releases to the Fox River

Per Cent of Total Estimated Releases by Facility

NCR Paper Coating Mills and Secondary Fiber Deink Mills

	Case 1	Case 2	Case 3	Case 4
NCR Paper Coating Mills				
NCR/Appleton	35.8 %	37.7 %	36.9 %	51.6 %
Appleton - Locks	3.55 %	2.67 %	2.04 %	2.56 %
Secondary Fiber Deink Mills				
P.H. Glatfelter	16.0 %	16.5 %	17.6 %	13.2 %
Wisconsin Tissue	3.71 %	3.60 %	3.62 %	2.72 %
Riverside	1.23 %	1.03 %	0.88 %	0.66 %
Fort James GB West	39.6 %	38.4 %	38.8 %	29.1 %

Secondary Fiber Non-Deink and Other Mills

Case	Case 1	Case 2	Case 3	Case 4
Kimberly Clark	0.004 %	0.003 %	0.003 %	0.002 %
U.S. Paper-Menasha	0.030 %	0.027 %	0.023 %	0.017 %
American Tissue	0.022 %	0.020 %	0.017 %	0.013 %
U.S. Paper - DePere	0.007 %	0.006 %	0.005 %	0.004 %
GB Packaging	0.005 %	0.005 %	0.004 %	0.003 %
Proctor & Gamble	0.013 %	0.012 %	0.010 %	0.007 %
Fort James GB East	0.012 %	0.011 %	0.009 %	0.007 %
Consolidated Papers	0.004 %	0.003 %	0.003 %	0.002 %

B. NCR/Appleton Papers

Data, Information Sources & PCB Discharge Allocation

CONTAINS CONFIDENTIAL BUSINESS INFORMATION

1) Production and material furnish

Year	National NCR Paper prod: Total PCBs consumed in emulsion lb/year	National NCR Paper prod: Total NCR paper production ton/year	NCR paper prod @ A? ton/year	PCBs in Emulsion Consumed by mill lb/year	Data Source
1954	*53,657*	*844*	480	30,530	1,2
1955	*352,122*	*5,536*	3,150	200,351	1,2
1956	530,977	*8,348*	4,750	302,117	1,2
1957	587,000	10,010	5,250	307,867	1,2
1958	779,000	13,264	7,100	416,986	1,2
1959	1,019,000	17,434	10,100	590,335	1,2
1960	1,149,000	20,703	10,950	607,716	1,2
1961	1,643,000	25,504	13,900	895,456	1,2
1962	1,953,000	29,708	18,050	1,188,805	1,2
1963	2,281,000	34,583	21,250	1,401,592	1,2
1964	2,705,000	41,762	23,700	1,535,092	1,2
1965	3,469,000	51,855	28,950	1,947,885	1,2
1966	4,246,000	60,584	34,100	2,389,487	1,2
1967	4,355,000	69,512	35,848	2,233,259	1,2
1968	5,801,000	83,250	42,946	2,992,550	1,2
1969	6,278,000	87,336	56,804	4,068,882	1,2
1970	6,611,000	91,576	53,934	3,893,571	1,2
1971	1,266,000	29,659	19,142	817,080	1,2
1972	0	0	0	0	1,2
Totals	45,066,755	681,476	390,002	25,817,341	

Data Sources
1. NCR - Appleton Papers letter (01/19/76); Bates No. GS0002304-2307
2. Grade Distribution at Appleton; Bates No. NCR 200297-298

2) Material Furnish — **Sources**
- 1954 - 1971: NCR PCB Coating emulsion — Letter (01/19/76); Bates No. GS0002304-2307
- 1954 - 1985: other non-PCB coatings — Statement Concerning PCBs (02/76); GN001022-1023
- 1954 - 1985: uncoated paper rolls

3) Products — **Sources**
- 1954 - 1971: NCR Paper (coating process only) — 1997 104(e) response; APX0024909-24961
- 1954 - 1985: other non-NCR paper (coating process only)

4) PCB losses to wastewater stream — **Sources**
- CASE 1: 2.0% PCB loss to mill sewer — Assumptions
- CASE 2: 2.5% PCB loss to mill sewer
- CASE 3: 3.0% PCB loss to mill sewer
- CASE 4: 5.0% PCB loss to mill sewer

- CASE 1: 50% PCB recovery in "honey tanks" — Assumptions
- CASE 2: 30% PCB recovery in "honey tanks"
- CASE 3: 10% PCB recovery in "honey tanks"
- CASE 4: 0% PCB recovery in "honey tanks"

5) PCBs in NCR Carbonless Broke Distributed — **Sources**
- 1967 - 1971: reported percentages of NCR broke generation — Accounting sheets (CBI); APX 0020801-0804
- 1954 - 1966: Estimates based on 1967 - 1971 data (10.6% avg)
- Percentage of broke coated with PCB emulsion: 62.5% — RMT Report dated 08/26/98

6) Percentage of NCR broke recycled to Fox Valley deink mills — **Sources**
- CASE 1: 80% of NCR broke generated was recycled to Fox Valley Deink mil — Assumptions
- CASE 2: 80% of NCR broke generated was recycled to Fox Valley Deink mills
- CASES 3 & 4: 100% of NCR broke generated was recycled to Fox Valley Deink mills

7) Appleton Papers Discharge Status — **Sources**
- 1954 - 1972: indirect discharge to City of Appleton POTW — 1997 104(e) response; APX0024909-24961

8) WWTP TSS/PCB Removal — **Sources**
- A. NCR/Appleton Papers — 1997 104(e) response; APX0024909-24961
  - 1954 - 1972: no treatment — WDNR Tech Memo 2d; February 1999
- B. City of Appleton POTW — Addendum to Tech Memo 2d; (Witthuhn Report, 2/7/99)
  - 1954 - 1972: Collection system bypasses - variable (16% - 33%)
  - 1954 - 1972: TSS/PCB removal at POTW - variable (57% - 85%)

9) PCB DISCHARGES

	lbs
CASE 1	167,240
CASE 2	292,669
CASE 3	451,547
CASE 4	836,198

NOTES: Percentages of total PCBs discharged to the Fox River are approximate and are subject to change based on continued review and allocations to other dischargers.

values expressed in italics are estimated or extrapolated from known data

D. Appleton Papers - Combined Locks

Data, Information Sources & PCB Discharge Allocation

CONTAINS CONFIDENTIAL BUSINESS INFORMATION

1) Production, fiber and material furnish

Year	Emulsion consumed by Locks lb/year	Mech pulp ton/year	Secondary fiber (phone bks) ton/year	Ground-wood Paper ton/year	Data Source
1954		25,550	18,250	*75055*	2,3
1955		25,550	18,250	*75055*	2,3
1956		25,550	18,250	*75055*	2,3
1957		21,900	18,250	77745	2,3
1958		18,250	18,250	72365	2,3
1959		18,250	21,900	*75286*	2,3
1960		18,250	21,900	*75286*	2,3
1961		18,250	21,900	*75286*	2,3
1962		18,250	21,900	*75286*	2,3
1963		18,250	21,900	*75286*	2,3
1964		18,250	21,900	*75286*	2,3
1965		18,250	21,900	*75286*	2,3
1966		18,250	21,900	*75286*	2,3
1967		18,250		*75286*	2,3
1968		63,875		*75286*	2,3
1969		63,875		75747	2,3
1970	744,649	63,875		133427	1,2,3
1971	174,739	63,875		113260	1,2,3
1972		63,875		133248	2,3
1973		73,000		*139723*	2,3
1974		73,000		146198	2,3
1975		73,000		128822	2,3
1976		73,000		147090	2,3
1977		73,000		154606	2,3
1978		73,000		157481	2,3
1979		73,000		165496	2,3
1980		73,000		162116	2,3
1981		73,000		178658	2,3
1982		73,000		172622	2,3
1983		73,000		178674	2,3
1984		73,000		185021	2,3
1985		73,000		185322	2,3
Totals	919,389	1,549,425	266,450	3,683,646	

Data Sources
1) Emulsion shipment logs; Bates no. APX0031388-31393
2) Lockwood Post Directories
3) Appleton Papers 1996 104(e) response

2) Material furnish (1954 through 1972) — **Sources**

A. Coating operations (1970 to 1971) — Emulsion shipment logs
Coating emulsion (lbs of PCBs reported) — Bates No. APX0031388-31393

B. Papermaking operations — Fiber furnish
Mechanical pulp (1954 to 1985) contains PCBs — Lockwood Post directories
Phone books - newsprint (1954 to 1996) contains PCBs
Appleton - Locks did not recycle NCR broke or converter trim from on-site or off-site operations — Appleton Papers 09/30/97 104(e) response

3) Products — **Sources**

1970 - 1971: NCR Paper (coating process only) — Appleton Papers 09/30/97 104(e) response
1954 - 1985: Groundwood book Paper

4) PCB losses to wastewater stream — **Sources**

A. Coating operations — Assumptions
CASE 1: 2.0% PCB loss to mill sewer
CASE 2: 2.5% PCB loss to mill sewer
CASE 3: 3.0% PCB loss to mill sewer
CASE 4: 5.0% PCB loss to mill sewer

B. Papermaking operations
CASE 1: 25% of PCBs from furnish partitioned to wastewater — Assumptions
CASE 2: 37.5% of PCBs from furnish partitioned to wastewater
CASES 3 & 4: 50% of PCBs from furnish partitioned to wastewater

5) PCBs in NCR carbonless broke generated — **Sources**

1987 - 1971: known percentages of NCR broke generation — Accounting sheets (CBI); APX0020801-0804
1954 - 1966: estimates based on 1987 - 1971 data
Percentage of broke coated with PCB emulsion: 62.5% — RMT report dated 08/26/98

6) Percentage of NCR broke recycled to Fox Valley mills — **Sources**

CASE 1: 80% of NCR broke generated was recycled to Fox Valley Deink mil — Assumptions
CASE 2: 90% of NCR broke generated was recycled to Fox Valley Deink mills
CASES 3 & 4: 100% of NCR broke generated was recycled to Fox Valley Deink mills

7) Appleton Papers discharge status (1954 - 1985) — **Sources**

1954 - 1985: direct discharge to the Fox River — 1997 104(e) response; APX0024909-24961 (Appleton Papers)

8) WWTP TSS/PCB removal (1954 through 1985) — **Sources**

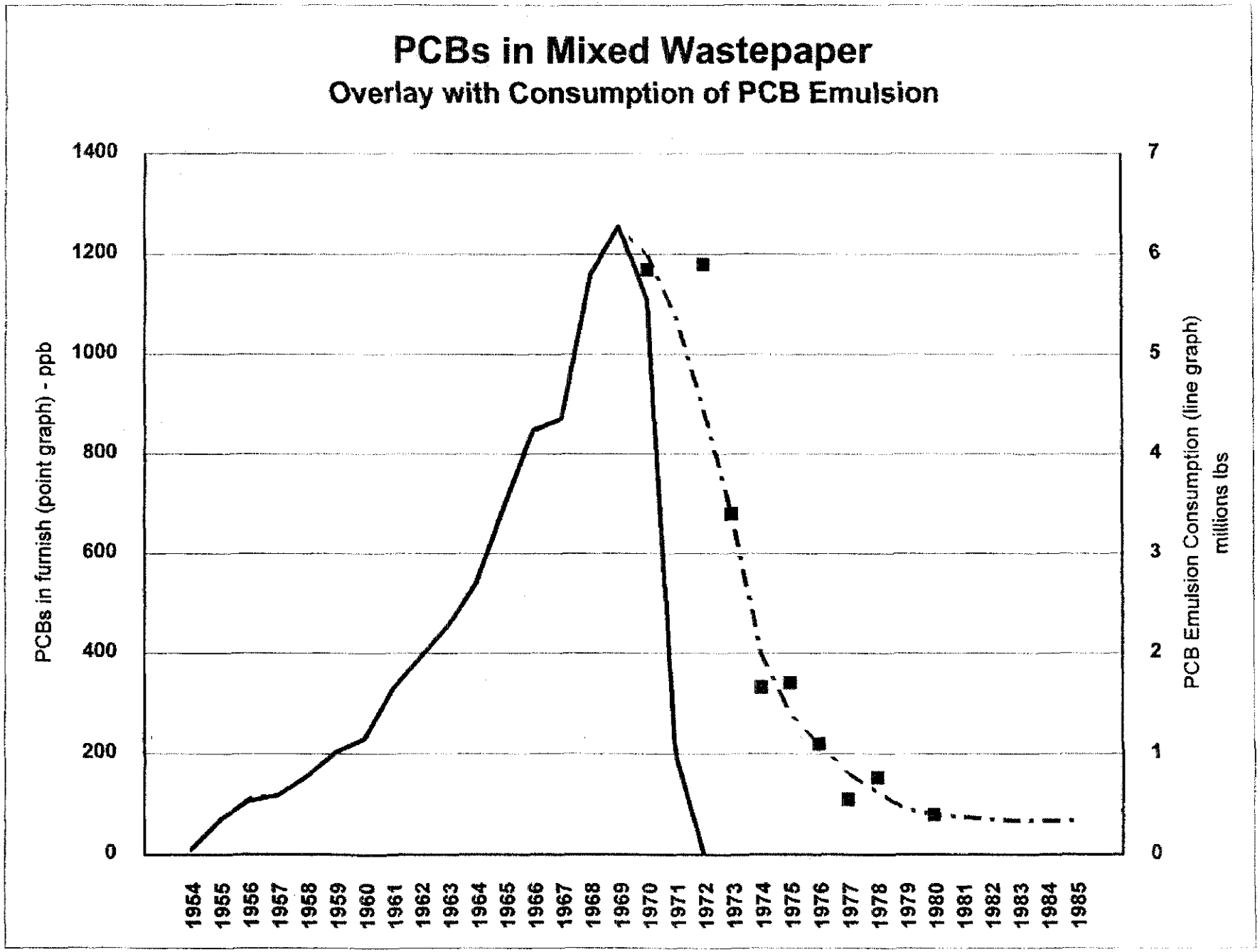
1954 through 1971: fiber recovery (10% removal) — Assumptions
1972 through 1974: fiber recovery and primary treatment (70% removal)
1975 through 1985: fiber recov., primary & secondary trtmt. (92% removal)

9) PCB DISCHARGES

	lbs
CASE 1	16,565
CASE 2	20,740
CASE 3	24,895
CASE 4	41,445

NOTES: Percentages of total PCBs discharged to the Fox River are approximate and are subject to change based on continued review and allocations to other dischargers.

values expressed in italics are estimated or extrapolated from known data


PCBs in Mixed Wastepaper
Overlay with Consumption of PCB Emulsion
PCBs in furnish (point graph) - ppb
PCB Emulsion Consumption (line graph)
millions lbs
0
200
400
600
800
1000
1200
1400
0
1
2
3
4
5
6
7
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
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1971
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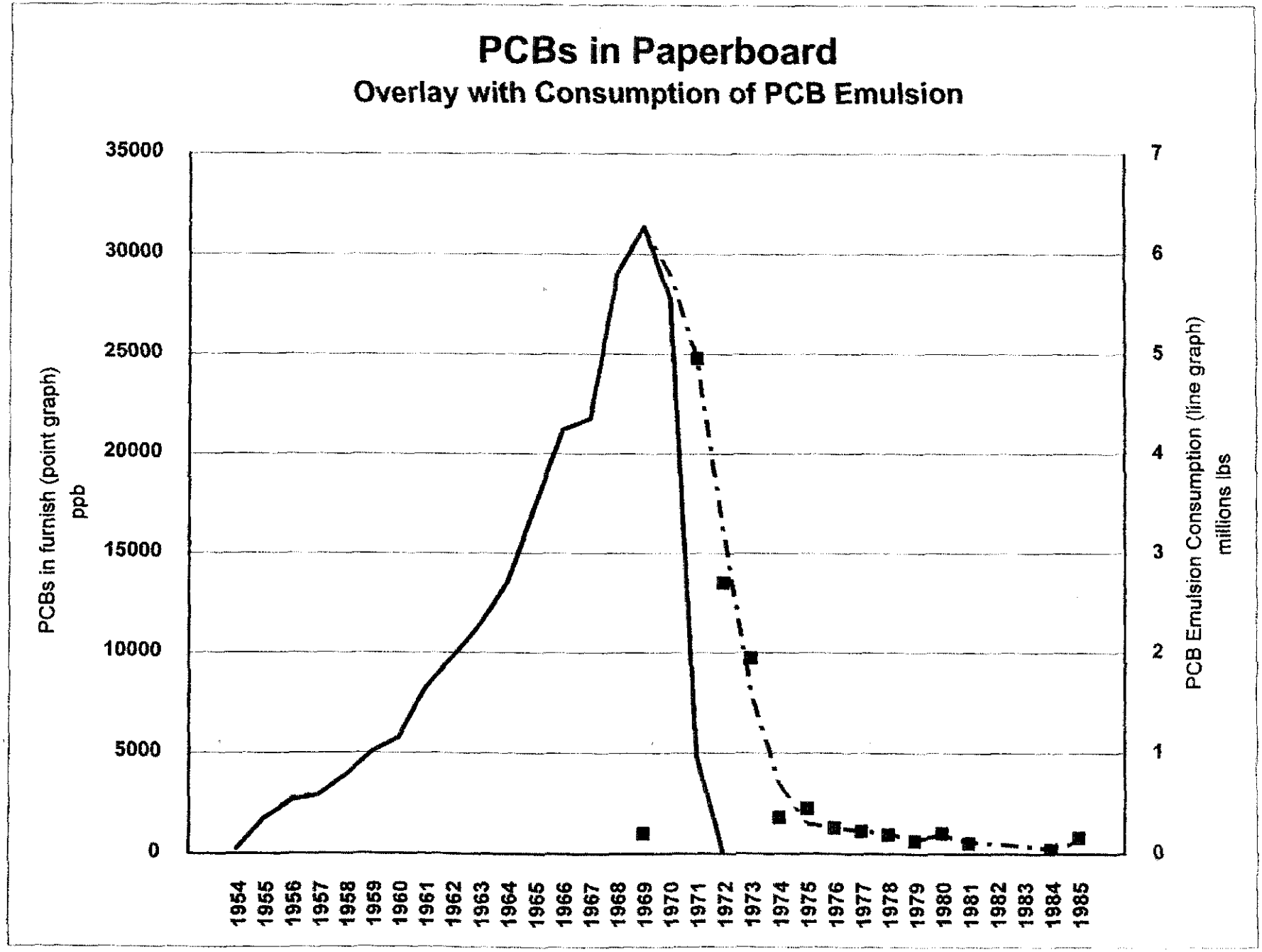
1984
1985


PCBs in Paperboard
Overlay with Consumption of PCB Emulsion
PCBs in furnish (point graph)
ppb
PCB Emulsion Consumption (line graph)
millions lbs
35000
30000
25000
20000
15000
10000
5000
0
7
6
5
4
3
2
1
0
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985

PCBs in Kraft Paper (DLK, OCC)
Overlay with Consumption of PCB Emulsion
PCBs in furnish (point graph)
ppb
700
600
500
400
300
200
100
0
PCB Emulsion Consumption (line graph)
millions lbs
7
6
5
4
3
2
1
0
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985

PCBs in Wood Pulp
PCBs in furnish (point graph)
ppb
700
600
500
400
300
200
100
0
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
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Fort Howard Paper Company

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF WISCONSIN
GREEN BAY DIVISION

UNITED STATES OF AMERICA and
THE STATE OF WISCONSIN,

Plaintiffs,

v. Case No. 10-CV-910

NCR CORPORATION, et al.,

Defendants.

AFFIDAVIT OF CRAIG JONES

I, Craig Jones, hereby declare and state as follows:

1. I am Craig Jones, Ph.D., Senior Ocean and Environmental Engineer in the Santa Cruz, CA office of Sea Engineering, Inc. I am a nationally recognized expert in the field measurement and analysis of hydrodynamic, sediment and contaminant transport processes in coastal, estuarine, riverine, and lacustrine environments. Over the past 15 years, I have worked closely as project manager and technical lead with federal, state, and local regulatory agencies in the analysis and solution of aquatic problems at numerous environmental sites nationwide, including multiple mega-sites, with a particular emphasis on sediment and contaminant transport studies. In addition, I continue to lead development efforts for state-of-the-science hydrodynamic and sediment measurement and modeling techniques in aquatic environments. I stay active in the scientific and engineering communities by continuing basic research, regularly participating in technical reviews, and teaching in workshops.

2. I have been retained by Appleton Papers Inc. to conduct an investigation into the hydrodynamic properties and contaminant transport mechanisms in the Lower Fox River ("LFR"), the 39-mile stretch of the Fox River between Lake Winnebago and the Bay of Green Bay. Specifically, I was retained to investigate transport pathways in Operable Unit 4 ("OU4") of the LFR, which stretches from the De Pere dam to the Bay of Green Bay.

3. Flow into OU4 is primarily over the De Pere dam, with the East River adding minimal flow (on average 10%) in the downstream portion. Flow over the De Pere dam is primarily regulated by outflows from Lake Winnebago at dams in Neenah and Menasha, Wisconsin.

4. Flow rates during a typical year vary from 30 to 280 cubic meters per second. Opening dams or large storms generally cause high flow events. The highest flow rate on record is approximately 650 cubic meters per second and corresponds to a 50-year recurrence interval.

5. Seiche motion in the Bay of Green Bay has an effect on the direction of river flow throughout OU4. A "seiche" is a standing wave in an enclosed or partially enclosed body of water. Seiche effects are caused by resonances in a body of water (e.g. Bay of Green Bay) that has been disturbed by a number of possible factors, most often meteorological effects such as wind and atmospheric pressure variations.

6. In 2003 and 2004, the United States Geological Survey ("USGS") and Sea Engineering, Inc. ("SEI") conducted a hydrodynamic study of OU4. In conjunction therewith, USGS conducted four field surveys that included measuring vertical velocity profiles at up to 30 locations within OU4. Monitoring water levels near the mouth of the LFR as part of this study provided insight into the significance of seiching from the Bay of Green Bay.

7. As part of its role in the hydrodynamic study, SEI developed a hydrodynamic model of OU4. The numerical model used in this study was the Environmental Fluid Dynamics Code ("EFDC"), which is a three-dimensional public domain modeling system that has been widely used in water quality and contaminant transport studies. EFDC is currently maintained by Tetra Tech, Inc. and supported by the United States Environmental Protection Agency.

8. To develop the hydrodynamic model of OU4, data from June 2003 were used to establish boundary conditions for model validation and the investigation of common transport patterns of the river. The June 2003 data were characterized by average flow over the De Pere dam combined with approximately thirty-centimeter-high seiche motion originating from the Bay of Green Bay.

9. The model validation demonstrates excellent agreement with the June 2003 data (R=0.97, where R=1 is perfect agreement) and thus accurately reproduces the flow reversals in OU4 due to seiche motion. The agreement between the modeled and measured results for the event verifies the applicability of this model to common flow events in OU4.

10. The validated model was used to investigate the effects of winds from the four most common directions on transport patterns in the LFR – west, south-southwest, north-northeast, and north-northwest. The wind velocity for these four cases was assumed to be a constant five meters per second, or approximately ten miles per hour. The measured wind database shows wind speeds equal to or greater than five meters per second more than one-third of the time.

11. An outfall was introduced at a single point along the western shoreline of the southwest lobe of OU4 to represent discharges from the Georgia-Pacific recycling mill. The

outfall was assigned a 0.014 cubic meters per second, or 0.33 million gallons per day, flow rate at receiving water temperature of twenty degrees Celsius.

12. A 550 milligrams per liter total suspended solids ("TSS") particle load and a 550 milligrams per liter conservative dye load were assumed to be constant at the outfall to track plume behavior during the simulations. The solids particles were assumed to have a settling speed of five millimeters per second to approximate the behavior of pulp fibers. The critical shear stress for the particles was assumed to be 1.5 dynes per cubic centimeter.

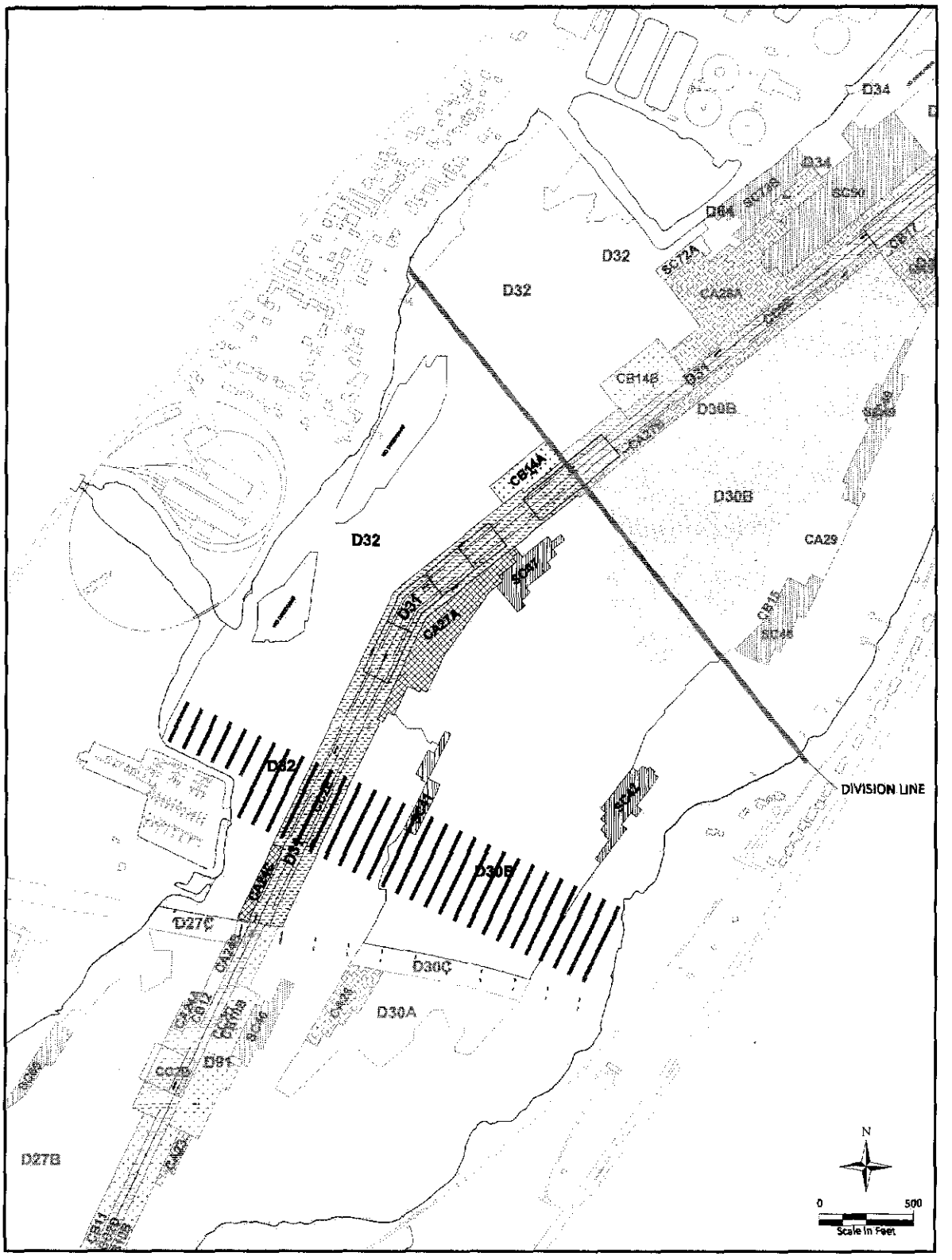
13. Based upon evaluation of the historical wind record, the northerly wind directions occur approximately 15% of the time and facilitated the creation of a counter-clockwise eddy in the southwestern lobe of OU4. Imposing the stated seiche conditions on the discharge produced a general transport configuration within the first two to four hours of the model run. The transport of both a conservative dye and settling solids were demonstrated in the model results.

14. Exhibit A depicts the approximate area of upstream, seiche-induced effluent solid transport from a theoretical discharge from the Georgia-Pacific recycling mill. Exhibit A compares this upstream movement of solids discharged from the Georgia-Pacific recycling mill to the line depicted in "Appendix B: Map Depicting Division of OU 4 Between Upper OU 4 and Lower OU 4" as portrayed in the October 14, 2010 Consent Decree with Georgia-Pacific Consumer Products LP in United States and the State of Wisconsin v. NCR Corp., et al. (E.D. Wis.).

I declare under the penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on this 22 day of November, 2010.

Craig Jones



Legend

- Sand Cap
- Cap A
- Cap B
- Cap C
- Dredge Area
- GP Upstream Seiche Effect
- GP Consent Decree Upstream Boundary
- TSCA Cap Area
- 2009 Production Dredge Area

Exhibit A
Upstream Seiche Effect and
Consent Decree Upstream Boundary
Remedial Areas in OU4 - Georgia Pacific Area
Lower Fox River OUs 2-5
November 17, 2010

Notes:
Remedial footprints represent current design, dated November 2010 and are subject to ongoing revision.
Horizontal Datum: Wisconsin State Plane-Central Zone, NAD83, US feet. Vertical Datum: NAVD88, US feet.
Map adapted from Anchor/QEA Remedial Area Figure for OU4 GP Area.

TETRA TECH

Lower Fox River Summary Totals

November 15, 2010

Tetra Tech Pay Items

Bid Item	Description	2011 Estimate Quantity	Unit	Unit Price	Extension	
Pre-Construction Work Elements						
1	Field Investigations	2.41	LS	$ -	$ -	
2	Agency Coordination	2.41	LS	$ 81,821.73	$ 197,541.03	as per SOV
3	Public Involvement	2.41	LS	$ 21,801.30	$ 52,634.71	as per SOV
4	Disposal Facility and Access Negotiation	2.41	LS	$ -	$ -	
5	Staging/Access Property Lease(s)	2.41	LS	$ -	$ -	
6	Site Historic Preservation Survey	2.41	LS	$ -	$ -	
7	Complete Remedial Design (RD-60%, 90%, and Final/100%)	2.41	LS	$ -	$ -	
				Subtotal	$ 250,175.75	
During Construction Work Elements						
8	Mobilization/Demobilization	2.41	LS	$ 1,069,031.80	$ 2,580,947.72	as per SOV
8.1	Insurance	2.41	LS	$ 1,466,000.00	$ 3,587,626.57	as per SOV
9	Submittals	2.41	LS	$ 23,914.29	$ 57,735.93	as per SOV
10	Infrastructure Construction and Removal	2.41	LS	$ -	$ -	
11	Bathymetric Surveying	2.41	LS	$ 2,160,861.58	$ 5,265,198.77	as per SOV
12.1	Agency Coordination and Reporting	2.41	LS	$ 67,138.17	$ 162,090.72	as per SOV
12.2	Community Health and Safety	2.41	LS	$ 526,500.00	$ 1,271,121.40	as per SOV
12.3	Construction Monitoring (Environmental)	2.41	LS	$ 600,340.68	$ 1,449,394.41	as per SOV
12.4	Construction Monitoring (Performance)	2.41	LS	$ 1,553,503.12	$ 3,750,000.36	as per SOV
	Structures, Utilities, and Outfalls:					assumes 6 hours per week for 28 weeks
13	Demolition/Rebuild/Repair	178.80	HR	$ 744	$ 133,027.20	Dredge Only
14	Environmental Protection Controls	2.41	LS	$ -	$ -	
15.1	OU 2/3 Dredging	0.00	CY	$ 81.00	$ -	unit price as stated in August 20, memo
	OU 2/3 Dredging	0.00	CY	$ 76.81	$ -	reduced unit price as stated in August 20, memo
15.2	OU 2/3 Dewatering	0.00	CY	$ 23.87	$ -	
15.3	OU 2/3 Disposal	0.00	TN	$ 30.76	$ -	based on .62 tons per insitu cubic yard dredged
16.1	OU 4 Dredging	469,650.00	CY	$ 28.00	$ 13,710,200.00	
16.2	OU 4 Dewatering	469,650.00	CY	$ 25.87	$ 12,668,665.34	
16.3	OU 4 Disposal	264,411.00	TN	$ 30.75	$ 8,130,638.25	based on .54 tons per insitu cubic yard dredged
17.1	OU 4 TSCA Dredging	0.00	CY	$ 32.00	$ -	
17.2	OU 4 TSCA Dewatering	0.00	CY	$ 23.87	$ -	
17.3	OU 4 TSCA Disposal	0.00	TN	$ 180.68	$ -	based on .68 tons per insitu cubic yard dredged disposed to EQ at 2011 pricing
18.1	Residual Dredging	40,782.00	CY	$ 28.00	$ 1,141,336.00	
18.2	Residual Dewatering	40,782.00	CY	$ 25.87	$ 1,054,831.14	
18.3	Residual Disposal	22,011.48	TN	$ 30.75	$ 676,853.81	based on .54 tons per insitu cubic yard dredged
20.1	Engineered Cap A (Minimum 13 inches)	3.63	AC	$ 119,000	$ 467,670.00	
	Sand (client purchase item) 6" sand min.	7,323.16	TN	$ 11.19	$ 81,946.18	assumes 9-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Stone (client purchase item) 7"	8,859.54	TN	$ 12.80	$ 108,582.11	assumes 10-inches of stone with 6% overlap and waste and 1.50 tons per cubic yard
20.2	Engineered Cap B (Minimum 16 inches)	1.22	AC	$ 167,000.00	$ 203,740.00	
	Sand (client purchase item) 9" sand min.	3,851.13	TN	$ 11.19	$ 33,918.35	assumes 12-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Stone (client purchase item) 7"	2,857.16	TN	$ 12.80	$ 34,011.65	assumes 10-inches of stone with 6% overlap and waste and 1.50 tons per cubic yard
20.3	Engineered Cap C (Minimum 33 inches)	14.99	AC	$ 274,000	$ 4,025,060.00	
	Sand (client purchase item) 9" sand min.	36,497.78	TN	$ 11.19	$ 408,440.32	assumes 12-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Stone (client purchase item) 7"	31,884.42	TN	$ 12.80	$ 406,533.10	assumes 10-inches of stone with 6% overlap and waste and 1.50 tons per cubic yard
	Quarry Spall (client purchase) 18"	77,328.82	TN	$ 12.77	$ 987,368.51	assumes 27-inches of quarry spall with no overlap and waste and 1.45 tons per cubic yard
20.4	Shoreline Cap	0.00	AC	$ -	$ -	
	Sand (client purchase item) 9" sand min.	0.00	TN	$ -	$ -	
	Stone (client purchase item) 7"	0.00	TN	$ -	$ -	
	Quarry spall (client purchase) 18"	0.00	TN	$ -	$ -	
21.1	Sand Cover 6"	3.36	AC	$ 51,000	$ 170,960.00	
	Sand purchase (client direct pay item)	8,242.38	TN	$ 11.19	$ 89,852.34	assumes 9-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
21.2	Residual Sand Cover 6" OU3	70.48	AC	$ 51,000.00	$ 3,594,700.26	assumes 66.8% of the dredge acreage will require residual sand cover
	Sand purchase (client direct pay item)	131,344.96	TN	$ 11.19	$ 1,469,340.44	assumes 9-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Residual Sand Cover 6"	0.00		$ -	$ -	
	Sand purchase (client direct pay item)	0.00		$ -	$ -	
				Subtotal	$67,706,550.84	
Post-Construction Work Elements						
23	EPA Closeout Report and Record Retention	2.41	LS	$ 183,266.71	$ 394,218.36	
26	Site Support	2.41	LS	$ 5,231,247.22	$12,606,582.67	
				Subtotal	$13,000,800.03	
				ROM	$80,956,626.72	
	Disposal of 50,000 tons of processed sand	53,214.29	TN	$ 5.76	$ 305,982.64	Dredge Only
	5.50% Tax on Dewatering	$ 13,723,296.48	LS	5.50%	$ 754,781.31	Sum of SOV's 15.2, 16.2, 17.2 & 18.2
	Change Request 56 Sand handling	8.13	LS	$ 675,000.00	$ (15,408.25)	Dredge Only
	Change Request 57					Can wait until April 2012 to complete
	In-fill other veil's					LLC to determine
	Debris disposal	1.04	LS	$ 12,000.00	$ 12,771.43	Dredge Only
	Escalation	2.41	LS	$ 185,000.00	$ 445,642.86	
	SPRI recovery on cubic yards under 580,000.00	71,072.60	CY	$ 4.34	$ 308,802.11	Dredge Only
					$ 82,901,712.81	
					$ 69,416,324.76	TT Billing
	Lump Sum Support Items	$ 31,821,337.47	/2.41 Years		$ 13,485,388.05	(Client Direct Pay)
	Dredge Support Items	$ 668,187.02	/2.41 Years			
	Lump Sum Items	$ 13,180,435.64	/Year			
	Dredge Items	$ 533,867.00	/Year			

TETRA TECH EC, INC.

Lower Fox River D308

November 15, 2010

Tetra Tech Pay Items

Bid Item	Description	2011 Estimate Quantity	Unit	Unit Price	Extension	
Pre-Construction Work Elements						
1	Field Investigations	0.86	LS	$ -	$ -	
2	Agency Coordination	0.86	LS	$ 81,621.73	$ 70,132.91	as per SOV
3	Public Involvement	0.86	LS	$ 21,801.36	$ 18,696.98	as per SOV
4	Disposal Facility and Access Negotiation	0.86	LS	$ -	$ -	
5	Staging/Access Property Lease(s)	0.86	LS	$ -	$ -	
6	Site Historic Preservation Survey	0.86	LS	$ -	$ -	
7	Complete Remedial Design (RD 60%, 90%, and Final/100%)	0.86	LS	$ -	$ -	
				Subtotal	$ 88,829.79	
During Construction Work Elements						
8	Mobilization/Demobilization	0.86	LS	$ 1,069,031.60	$ 915,312.80	as per SOV
8.1	Insurance	0.86	LS	$ 1,486,000.00	$ 1,273,714.29	as per SOV
9	Submittals	0.86	LS	$ 23,814.29	$ 20,497.96	as per SOV
10	Infrastructure Construction and Removal	0.86	LS	$ -	$ -	
11	Bathymetric Surveying	0.86	LS	$ 2,160,851.56	$ 1,849,901.34	as per SOV
12.1	Agency Coordination and Reporting	0.86	LS	$ 67,139.17	$ 57,647.00	as per SOV
12.2	Community Health and Safety	0.86	LS	$ 526,500.00	$ 451,285.71	as per SOV
12.3	Construction Monitoring (Environmental)	0.86	LS	$ 600,340.86	$ 514,577.90	as per SOV
12.4	Construction Monitoring (Performance)	0.86	LS	$ 1,863,503.12	$ 1,331,574.10	as per SOV
	Structures, Utilities, and Outfalls:					assumes 8 hours per week for 26 weeks
13	Demolition/Rebuild/Repair	96.60	HR	$ 744	$ 74,103.43	Dredge Only
14	Environmental Protection Controls	0.86	LS	$ -	$ -	
15.1	OU 2/3 Dredging	0.00	CY	$ 91.00	$ -	unit price as stated in August 20, memo
	OU 2/3 Dredging	0.00	CY	$ 78.81	$ -	reduced unit price as stated in August 20, memo
15.2	OU 2/3 Dewatering	0.00	CY	$ 23.87	$ -	
15.3	OU 2/3 Disposal	0.00	TN	$ 30.75	$ -	based on .62 tons per insitu cubic yard dredged
16.1	OU 4 Dredging	275,487.00	CY	$ 28.00	$ 7,713,636.00	
16.2	OU 4 Dewatering	275,487.00	CY	$ 25.87	$ 7,127,647.52	
16.3	OU 4 Disposal	148,762.98	TN	$ 30.75	$ 4,574,481.64	based on .54 tons per insitu cubic yard dredged
17.1	OU 4 TSCA Dredging	0.00	CY	$ 32.00	$ -	
17.2	OU 4 TSCA Dewatering	0.00	CY	$ 23.87	$ -	
17.3	OU 4 TSCA Disposal	0.00	TN	$ 188.68	$ -	based on .68 tons per insitu cubic yard dredged disposal to EQ at 2011 pricing
18.1	Residual Dredging	21,361.00	CY	$ 28.00	$ 598,108.00	
18.2	Residual Dewatering	21,361.00	CY	$ 25.87	$ 552,671.01	
18.3	Residual Disposal	11,534.94	TN	$ 30.75	$ 354,666.41	based on .54 tons per insitu cubic yard dredged
20.1	Engineered Cap A (Minimum 13 inches)	0.00	AC	$ 119,000	$ -	
	Sand (client purchase item) 6" sand min.	0.00	TN	$ 11.19	$ -	assumes 9-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Stone (client purchase item) 7"	0.00	TN	$ 12.80	$ -	assumes 10-inches of stone with 8% overlap and waste and 1.50 tons per cubic yard
20.2	Engineered Cap B (Minimum 15 inches)	0.00	AC	$ 167,000.00	$ -	
	Sand (client purchase item) 8" sand min.	0.00	TN	$ 11.19	$ -	assumes 12-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Stone (client purchase item) 7"	0.00	TN	$ 12.80	$ -	assumes 10-inches of stone with 8% overlap and waste and 1.50 tons per cubic yard
20.3	Engineered Cap C (Minimum 33 inches)	0.00	AC	$ 274,000	$ -	
	Sand (client purchase item) 9" sand min.	0.00	TN	$ 11.19	$ -	assumes 12-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Stone (client purchase item) 7"	0.00	TN	$ 12.80	$ -	assumes 10-inches of stone with 8% overlap and waste and 1.50 tons per cubic yard
	Quarry Spall (client purchase) 18"	0.00	TN	$ 12.72	$ -	assumes 27-inches of quarry spall with no overlap and waste and 1.45 tons per cubic yard
20.4	Shoreline Cap	0.00	AC	$ -	$ -	
	Sand (client purchase item) 9" sand min.	0.00	TN	$ -	$ -	
	Stone (client purchase item) 7"	0.00	TN	$ -	$ -	
	Quarry spall (client purchase) 18"	0.00	TN	$ -	$ -	
21.1	Sand Cover 6"	0.00	AC	$ 51,000	$ -	
	Sand purchase (client direct pay item)	0.00	TN	$ 11.19	$ -	assumes 9-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
21.2	Residual Sand Cover 6" OU3	36.94	AC	$ 51,000.00	$ 1,883,861.46	assumes 59.8% of the dredge acreage will require residual sand cover
	Sand purchase (client direct pay item)	68,831.13	TN	$ 11.19	$ 770,220.30	assumes 9-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Residual Sand Cover 6"	0.00		$ -	$ -	
	Sand purchase (client direct pay item)	0.00		$ -	$ -	
				Subtotal	$ 36,084,216.84	
Post-Construction Work Elements						
23	EPA Closeout Report and Record Retention	0.86	LS	$ 163,285.71	$ 139,959.18	
28	Site Support	0.86	LS	$ 5,221,247.22	$ 4,475,354.76	
				Subtotal	$ 4,615,313.94	
				ROM	$34,788,352.57	
	Disposal of 50,000 tons of processed sand	29,843.88	TN	$ 5.75	$ 170,448.43	Dredge Only
	5.50% Tax on Dewatering	$ 7,680,318.53	LS	5.50%	$ 422,417.52	Sum of SOVs 15.2, 16.2, 17.2 & 18.2
	Change Request 68 Sand handling	0.07	LS	$ 875,000.00	$ 64,843.75	Dredge Only
	Change Request 57					Can wait until April 2012 to complete
	In-fill other wells					L&C to determine
	Debris disposal	0.99	LS	$ 12,000.00	$ 7,114.29	Dredge Only
	Escalation	0.86	LS	$ 185,000.00	$ 158,571.43	
	SPRI recovery on cubic yards under 569,000.00	39,775.84	CY	$ 4.34	$ 172,710.87	Dredge Only
	Work completed in 2009 and 2010 ==>		10,931,194.44		$35,784,456.85	
		$	8,901,356		$29,486,097.27	TT Billing
		$	2,029,838		$ 6,299,359.58	(Client Direct Pay)

TETRA TECH [illegible]

Lower Fox River OU2

November 15, 2010

Tetra Tech Pay Items

Bid Item	Description	2011 Estimate Quantity	Unit	Unit Price	Extension	
Pre-Construction Work Elements						
1	Field Investigations	0.60	LS	$ -	$ -	
2	Agency Coordination	0.60	LS	$ 81,821.73	$ 49,093.04	as per SOV
3	Public Involvement	0.60	LS	$ 21,801.36	$ 13,080.82	as per SOV
4	Disposal Facility and Access Negotiation	0.80	LS	$ -	$ -	
5	Staging/Access Property Lease(s)	0.80	LS	$ -	$ -	
6	Site Historic Preservation Survey	0.80	LS	$ -	$ -	
7	Complete Remedial Design (RD-60%, 90%, and Final 100%)	0.80	LS	$ -	$ -	
				Subtotal	$ 62,173.85	
During Construction Work Elements						
8	Mobilization/Demobilization	0.80	LS	$ 1,069,021.60	$ 841,416.96	as per SOV
8.1	Insurance	0.80	LS	$ 1,466,000.00	$ 891,600.00	as per SOV
9	Submittals	0.80	LS	$ 23,914.29	$ 14,348.57	as per SOV
10	Infrastructure Construction and Removal	0.80	LS	$ -	$ -	
11	Bathymetric Surveying	0.80	LS	$ 2,180,851.56	$ 1,308,510.94	as per SOV
12.1	Agency Coordination and Reporting	0.80	LS	$ 67,136.17	$ 40,282.90	as per SOV
12.2	Community Health and Safety	0.80	LS	$ 526,500.00	$ 315,900.00	as per SOV
12.3	Construction Monitoring (Environmental)	0.80	LS	$ 600,340.86	$ 360,204.53	as per SOV
12.4	Construction Monitoring (Performance)	0.80	LS	$ 1,553,503.12	$ 932,101.87	as per SOV
	Structures, Utilities, and Outfalls:					assumes 6 hours per week for 28 weeks
13	Demolition/Rebuild/Repair	64.80	HR	$ 744	$ 48,211.20	Dredge Only
14	Environmental Protection Controls	0.80	LS	$ -	$ -	
15.1	OU 2/3 Dredging	0.00	CY	$ 91.00	$ -	unit price as stated in August 20 memo
	OU 2/3 Dredging	0.00	CY	$ 78.81	$ -	reduced unit price as stated in August 20 memo
15.2	OU 2/3 Dewatering	0.00	CY	$ 23.87	$ -	
15.3	OU 2/3 Disposal	0.00	TN	$ 30.75	$ -	based on .62 tons per insitu cubic yard dredged
16.1	OU 4 Dredging	175,267.00	CY	$ 26.00	$ 4,557,476.00	
16.2	OU 4 Dewatering	175,267.00	CY	$ 25.87	$ 4,534,665.51	
16.3	OU 4 Disposal	94,644.18	TN	$ 30.75	$ 2,910,308.54	based on .54 tons per insitu cubic yard dredged
17.1	OU 4 TSCA Dredging	0.00	CY	$ 32.00	$ -	
17.2	OU 4 TSCA Dewatering	0.00	CY	$ 23.87	$ -	
17.3	OU 4 TSCA Disposal	0.00	TN	$ 180.66	$ -	based on .68 tons per insitu cubic yard dredged. disposal to EQ at 2011 pricing
18.1	Residual Dredging	16,942.00	CY	$ 28.00	$ 474,376.00	
18.2	Residual Dewatering	16,942.00	CY	$ 25.87	$ 438,338.67	
18.3	Residual Disposal	9,148.68	TN	$ 30.75	$ 281,321.91	based on .54 tons per insitu cubic yard dredged
20.1	Engineered Cap A (Minimum 13 inches)	0.00	AC	$ 119,000	$ -	
	Sand (client purchase item) 6" sand min.	0.00	TN	$ 11.19	$ -	assumes 9-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Stone (client purchase item) 7"	0.00	TN	$ 12.80	$ -	assumes 10-inches of stone with 8% overlap and waste and 1.50 tons per cubic yard
20.2	Engineered Cap B (Minimum 16 inches)	0.00	AC	$ 167,000.00	$ -	
	Sand (client purchase item) 9" sand min.	0.00	TN	$ 11.19	$ -	assumes 12-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Stone (client purchase item) 7"	0.00	TN	$ 12.80	$ -	assumes 10-inches of stone with 8% overlap and waste and 1.50 tons per cubic yard
20.3	Engineered Cap C (Minimum 33 inches)	0.00	AC	$ 274,000	$ -	
	Sand (client purchase item) 9" sand min.	0.00	TN	$ 11.19	$ -	assumes 12-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Stone (client purchase item) 7"	0.00	TN	$ 12.80	$ -	assumes 10-inches of stone with 8% overlap and waste and 1.50 tons per cubic yard
	Quarry Spall (client purchase) 18"	0.00	TN	$ 12.77	$ -	assumes 27-inches of quarry spall with no overlap and waste and 1.45 tons per cubic yard
20.4	Shoreline Cap	0.00	AC	$ -	$ -	
	Sand (client purchase item) 6" sand min	0.00	TN	$ -	$ -	
	Stone (client purchase item) 7"	0.00	TN	$ -	$ -	
	Quarry spall (client purchase) 18"	0.00	TN	$ -	$ -	
21.1	Sand Cover 6"	0.00	AC	$ 51,000	$ -	
	Sand purchase (client direct pay item)	0.00	TN	$ 11.19	$ -	assumes 9-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
21.2	Residual Sand Cover 6" CU3	29.30	AC	$ 51,000.00	$ 1,494,097.02	assumes 50.8% of the dredge acreage will require residual sand cover
	Sand purchase (client direct pay item)	54,598.20	TN	$ 11.19	$ 610,864.35	assumes 9-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Residual Sand Cover 6"	0.00		$ -	$ -	
	Sand purchase (client direct pay item)	0.00		$ -	$ -	
				Subtotal	$ 29,264,026.98	
Post-Construction Work Elements						
23	EPA Closeout Report and Record Retention	0.60	LS	$ 163,285.71	$ 97,971.43	
26	Site Support	0.60	LS	$ 5,221,247.22	$ 3,132,748.33	
				Subtotal	$ 3,230,719.76	
				ROM	$23,466,920.61	
	Disposal of 50,000 tons of processed sand	18,285.71	TN	$ 5.75	$ 110,892.86	Dredge Only
	5.50% Tax on Dewatering	$ 4,073,004.18	LS	5.50%	$ 273,515.23	Sum of SOV's 15.2, 16.2, 17.2 & 18.2
	Change Request 56 Sand handling	0.85	LS	$ 875,000.00	$ 42,187.50	Dredge Only
	Change Request 57					Can wait until April 2012 to complete
	Infill other ve's					LLC to determine
	Debris disposal	0.39	LS	$ 12,000.00	$ 4,625.57	Dredge Only
	Escalation	0.60	LS	$ 185,000.00	$ 111,000.00	
	SPRI recovery on cubic yards under 500,000.00	25,754.84	CY	$ 4.34	$ 111,830.24	Dredge Only
	Work completed in 2009 and 2010 ==>		326,207.41		$ 24,150,075.01	
			267,296		$ 19,958,443.52	TT Billing
			58,909		$ 4,191,631.48	(Client Direct Pay)

TETRA TECH

Lower Fox River CC2E

November 15, 2010

Tetra Tech Pay Items

Bid Item	Description	2011 Estimate Quantity	Unit	Unit Price	Extension	
Pre-Construction Work Elements						
1	Field Investigations	0.73	LS	$ -	$ -	
2	Agency Coordination	0.73	LS	$ 81,821.73	$ 59,612.97	as per SOV
3	Public Involvement	0.73	LS	$ 21,801.36	$ 15,883.65	as per SOV
4	Disposal Facility and Access Negotiation	0.73	LS	$ -	$ -	
5	Staging/Access Property Lease(s)	0.73	LS	$ -	$ -	
6	Site Historic Preservation Survey	0.73	LS	$ -	$ -	
7	Complete Remedial Design (RD-60%, 90%, and Final/100%)	0.73	LS	$ -	$ -	
				Subtotal	$ 75,496.62	
During Construction Work Elements						
8	Mobilization/Demobilization	0.73	LS	$ 1,069,031.60	$ 778,865.88	as per SOV
8.1	Insurance	0.73	LS	$ 1,456,000.00	$ 1,062,057.14	as per SOV
9	Submittals	0.73	LS	$ 23,914.29	$ 17,423.27	as per SOV
10	Infrastructure Construction and Removal	0.73	LS	$ -	$ -	
11	Bathymetric Surveying	0.73	LS	$ 2,160,851.56	$ 1,588,906.14	as per SOV
12.1	Agency Coordination and Reporting	0.73	LS	$ 67,138.17	$ 48,914.95	as per SOV
12.2	Community Health and Safety	0.73	LS	$ 526,500.00	$ 383,592.86	as per SOV
12.3	Construction Monitoring (Environmental)	0.73	LS	$ 600,340.86	$ 437,391.21	as per SOV
12.4	Construction Monitoring (Performance)	0.73	LS	$ 1,553,503.12	$ 1,131,837.99	as per SOV
	Structures, Utilities, and Outfalls:					assumes 6 hours per week for 28 weeks
13	Demolition/Rebuild/Repair	0.00	HR	$ 744	$ -	Dredge Only
14	Environmental Protection Controls	0.73	LS	$ -	$ -	
15.1	OU 2/3 Dredging	0.00	CY	$ 91.00	$ -	unit price as stated in August 20, memo
	OU 2/3 Dredging	0.00	CY	$ 76.81	$ -	reduced unit price as stated in August 20, memo
15.2	OU 2/3 Dewatering	0.00	CY	$ 23.87	$ -	
15.3	OU 2/3 Disposal	0.00	TN	$ 30.75	$ -	based on .62 tons per insitu cubic yard dredged
16.1	OU 4 Dredging	0.00	CY	$ 28.00	$ -	
16.2	OU 4 Dewatering	0.00	CY	$ 25.87	$ -	
16.3	OU 4 Disposal	0.00	TN	$ 30.15	$ -	based on .54 tons per insitu cubic yard dredged
17.1	OU 4 TSCA Dredging	0.00	CY	$ 32.00	$ -	
17.2	OU 4 TSCA Dewatering	0.00	CY	$ 23.87	$ -	
17.3	OU 4 TSCA Disposal	0.00	TN	$ 189.95	$ -	based on .68 tons per insitu cubic yard dredged, disposal to EQ at 2011 pricing
18.1	Residual Dredging	0.00	CY	$ 28.00	$ -	
18.2	Residual Dewatering	0.00	CY	$ 25.87	$ -	
18.3	Residual Disposal	0.00	TN	$ 30.75	$ -	based on .54 tons per insitu cubic yard dredged
20.1	Engineered Cap A (Minimum 13 inches)	0.00	AC	$ 119,000	$ -	
	Sand (client purchase item) 6" sand min.	0.00	TN	$ 11.19	$ -	assumes 9-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Stone (client purchase item) 7"	0.00	TN	$ 12.80	$ -	assumes 10-inches of stone with 8% overlap and waste and 1.50 tons per cubic yard
20.2	Engineered Cap B (Minimum 16 inches)	0.00	AC	$ 167,000.00	$ -	
	Sand (client purchase item) 9" sand min.	0.00	TN	$ 11.19	$ -	assumes 12-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Stone (client purchase item) 7"	0.00	TN	$ 12.80	$ -	assumes 10-inches of stone with 8% overlap and waste and 1.50 tons per cubic yard
20.3	Engineered Cap C (Minimum 33 inches)	14.99	AC	$ 274,000	$ 4,025,060.00	
	Sand (client purchase item) 9" sand min.	36,497.79	TN	$ 11.19	$ 408,410.32	assumes 12-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Stone (client purchase item) 7"	31,994.82	TN	$ 12.80	$ 409,533.70	assumes 10-inches of stone with 8% overlap and waste and 1.50 tons per cubic yard
	Quarry Spall (client purchase) 18"	77,320.92	TN	$ 12.77	$ 987,386.81	assumes 27-inches of quarry spall with no overlap and waste and 1.45 tons per cubic yard
20.4	Shoreline Cap	0.00	AC	$ -	$ -	
	Sand (client purchase item) 9" sand min	0.00	TN	$ -	$ -	
	Stone (client purchase item) 7"	0.00	TN	$ -	$ -	
	Quarry spall (client purchase) 18"	0.00	TN	$ -	$ -	
21.1	Sand Cover 6"	0.00	AC	$ 51,000	$ -	
	Sand purchase (client direct pay item)	0.00	TN	$ 11.19	$ -	assumes 9-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
21.2	Residual Sand Cover 6" OU3	0.00	AC	$ 51,000.00	$ -	assumes 58.8% of the dredge acreage will require residual sand cover
	Sand purchase (client direct pay item)	0.00	TN	$ 11.19	$ -	assumes 9-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Residual Sand Cover 6"	0.00		$ -	$ -	
	Sand purchase (client direct pay item)	0.00		$ -	$ -	
				Subtotal	$11,299,980.26	
Post-Construction Work Elements						
23	EPA Closeout Report and Record Retention	0.73	LS	$ 163,265.71	$ 119,965.30	
26	Site Support	0.73	LS	$ 5,221,247.22	$ 3,804,051.55	
				Subtotal	$ 3,923,016.85	
				ROM	$15,298,493.84	
	Disposal of 50,000 tons of processed sand	0.00	TN	$ 5.75	$ -	Dredge Only
	5.50% Tax on Dewatering	$ -	LS	5.50%	$ -	Sum of SOVs 15.2, 16.2, 17.2 & 18.2
	Change Request 56 Sand handling	0.00	LS	$ 675,000.00	$ -	Dredge Only
	Change Request 57					Can wait until April 2012 to complete
	in-fill cities w/s					LLC to determine
	Debris disposal	0.00	LS	$ 12,000.00	$ -	Dredge Only
	Escalation	0.73	LS	$ 185,000.00	$ 134,786.71	
	SPRI recovery on cubic yards under 580,000.00	0.00	CY	$ 4.34	$ -	Dredge Only
					$ 15,433,279.55	
					$ 13,627,946.82	TT Billing
					$ 1,805,330.83	(Client Direct Pay)

TETRA TECH

Lower Fox River D31

November 15, 2010

Tetra Tech Pay Items

Bid Item	Description	2011 Estimate Quantity	Unit	Unit Price	Extension	
Pre-Construction Work Elements						
1	Field Investigations	0.12	LS	$ -	$ -	
2	Agency Coordination	0.12	LS	$ 81,821.73	$ 9,035.50	as per SOV
3	Public Involvement	0.12	LS	$ 21,801.36	$ 2,647.31	as per SOV
4	Disposal Facility and Access Negotiation	0.12	LS	$ -	$ -	
5	Staging/Access Property Lease(s)	0.12	LS	$ -	$ -	
6	Site Historic Preservation Survey	0.12	LS	$ -	$ -	
7	Complete Remedial Design (RD 60% 90% and Final 100%)	0.12	LS	$ -	$ -	
				Subtotal	$ 12,682.80	
During Construction Work Elements						
8	Mobilization/Demobilization	0.12	LS	$ 1,099,031.60	$ 129,810.98	as per SOV
8.1	Insurance	0.12	LS	$ 1,486,000.00	$ 180,442.96	as per SOV
9	Submittals	0.12	LS	$ 23,914.29	$ 2,903.88	as per SOV
10	Infrastructure Construction and Removal	0.12	LS	$ -	$ -	
11	Bathymetric Surveying	0.12	LS	$ 2,180,851.56	$ 264,817.59	as per SOV
12.1	Agency Coordination and Reporting	0.12	LS	$ 67,138.17	$ 8,152.49	as per SOV
12.2	Community Health and Safety	0.12	LS	$ 526,500.00	$ 63,932.14	as per SOV
12.3	Construction Monitoring (Environmental)	0.12	LS	$ 800,340.68	$ 72,898.64	as per SOV
12.4	Construction Monitoring (Performance)	0.12	LS	$ 1,559,503.12	$ 188,939.86	as per SOV
	Structures, Utilities, and Outfalls:					assumes 5 hours per week for 28 weeks
13	Demolition/Rebuild/Repair	14.40	HR	$ 744	$ 10,713.60	Dredge Only
14	Environmental Protection Controls	0.12	LS	$ -	$ -	
15.1	OU 2/3 Dredging	0.00	CY	$ 91.00	$ -	unit price as stated in August 20, memo
	OU 2/3 Dredging	0.00	CY	$ 78.81	$ -	reduced unit price as stated in August 20, memo
15.2	OU 2/3 Dewatering	0.00	CY	$ 23.87	$ -	
16.3	OU 2/3 Disposal	0.00	TN	$ 30.75	$ -	based on .62 tons per insitu cubic yard dredged
16.1	OU 4 Dredging	38,896.00	CY	$ 25.00	$ 1,099,088.00	
16.2	OU 4 Dewatering	38,896.00	CY	$ 25.87	$ 1,006,352.31	
16.3	OU 4 Disposal	21,003.84	TN	$ 30.75	$ 645,868.08	based on .54 tons per insitu cubic yard dredged
17.1	OU 4 TSCA Dredging	0.00	CY	$ 32.00	$ -	
17.2	OU 4 TSCA Dewatering	0.00	CY	$ 23.87	$ -	
17.3	OU 4 TSCA Disposal	0.00	TN	$ 580.66	$ -	based on .68 tons per insitu cubic yard dredged. disposed to EQ at 2011 pricing
18.1	Residual Dredging	2,459.00	CY	$ 26.00	$ 66,852.00	
18.2	Residual Dewatering	2,459.00	CY	$ 26.87	$ 69,401.46	
18.3	Residual Disposal	1,327.86	TN	$ 30.75	$ 40,821.70	based on .54 tons per insitu cubic yard dredged
20.1	Engineered Cap A (Minimum 13 inches)	0.00	AC	$ 119,000	$ -	
	Sand (client purchase item) 6" sand min.	0.00	TN	$ 11.19	$ -	assumes 9-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Stone (client purchase item) 7"	0.00	TN	$ 12.80	$ -	assumes 10-inches of stone with 8% overlap and waste and 1.50 tons per cubic yard
20.2	Engineered Cap B (Minimum 18 inches)	0.00	AC	$ 167,000.00	$ -	
	Sand (client purchase item) 9" sand min.	0.00	TN	$ 11.19	$ -	assumes 12-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Stone (client purchase item) 7"	0.00	TN	$ 12.80	$ -	assumes 10-inches of stone with 8% overlap and waste and 1.50 tons per cubic yard
20.3	Engineered Cap C (Minimum 33 inches)	0.00	AC	$ 274,000	$ -	
	Sand (client purchase item) 6" sand min.	0.00	TN	$ 11.19	$ -	assumes 12-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Stone (client purchase item) 7"	0.00	TN	$ 12.80	$ -	assumes 10-inches of stone with 8% overlap and waste and 1.50 tons per cubic yard
	Quarry Spall (client purchase) 18"	0.00	TN	$ 12.77	$ -	assumes 27-inches of quarry spall with no overlap and waste and 1.45 tons per cubic yard
20.4	Shoreline Cap	0.00	AC	$ -	$ -	
	Sand (client purchase item) 9" sand min.	0.00	TN	$ -	$ -	
	Stone (client purchase item) 7"	0.00	TN	$ -	$ -	
	Quarry spall (client purchase) 18"	0.00	TN	$ -	$ -	
21.1	Sand Cover 6"	0.00	AC	$ 51,000	$ -	
	Sand purchase (client direct pay item)	0.00	TN	$ 11.19	$ -	assumes 9-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
21.2	Residual Sand Cover 6" OU3	4.25	AC	$ 51,000.00	$ 216,840.78	assumes 59.6% of the dredge acreage will require residual sand cover
	Sand purchase (client direct pay item)	7,922.77	TN	$ 11.19	$ 88,655.76	assumes 9-inches of sand with 10% overlap and waste and 1.4 tons per cubic yard
	Residual Sand Cover 6"	0.00		$ -	$ -	
	Sand purchase (client direct pay item)	0.00		$ -	$ -	
				Subtotal	$ 4,142,421.92	
Post-Construction Work Elements						
23	EPA Closeout Report and Record Retention	0.12	LS	$ 163,286.71	$ 19,627.55	
24	Site Support	0.12	LS	$ 5,721,247.22	$ 634,006.59	
				Subtotal	$ 653,634.14	
				ROM	$ 4,808,840.87	
	Disposal of 50,000 tons of processed sand	4,265.71	TN	$ 5.75	$ 24,542.85	Dredge Only
	5.50% Tax on Dewatering	$ 1,069,873.77	LS	5.50%	$ 58,848.56	Sum of SOV's 15.2, 16.2, 17.2 & 18.2
	Change Request 56 Sand handling	0.01	LS	$ 875,000.00	$ 9,375.00	Dredge Only
	Change Request 57					Can wait until April 2012 to complete
	In-fill other ve's					LLC to determine
	Debris disposal	0.09	LS	$ 12,000.00	$ 1,028.57	Dredge Only
	Escalation	0.12	LS	$ 185,000.00	$ 22,464.29	
	SPRI recovery on cubic yards under 580,600.00	5,541.32	CY	$ 4.34	$ 24,060.99	Dredge Only
					$ 4,949,261.13	
					$ 4,089,385.61	TT Billing
					$ 859,875.52	(Client Direct Pay)

EXHIBIT F